IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

HESCO BASTION LIMITED,	)	
	)	
Plaintiff,	)	
	)	C.A. No. _____
v.	)	
	)	
ACS HOLDINGS USA, LLC,	)	
	)	
Defendant.	)	

COMPLAINT

Plaintiff, Hesco Bastion Limited ("Hesco"), for its complaint against defendant, ACS Holdings USA, LLC ("ACS"), alleges as follows:

PARTIES

1. Hesco is a United Kingdom corporation with its principal place of business in Leeds, UK. Hesco also has an affiliate in Hammond, Louisiana.

2. ACS is a Delaware corporation with its principal place of business in Orem, Utah.

JURISDICTION AND VENUE

3. This is an action for patent infringement arising from Title 35 of the United States Code, 35 U.S.C. §§ 1 *et seq.*, and trademark infringement under the Lanham Act, 15 U.S.C. §§ 1051 *et seq.*, and the common law.

4. Exclusive subject matter jurisdiction over this matter is conferred upon the Court pursuant to 28 U.S.C. §§ 1331 and 1338, 1367, and 15 U.S.C. § 1121(a).

5. Subject matter jurisdiction also exists under 28 U.S.C. § 1332. Diversity of citizenship exists and the amount in controversy exceeds $75,000, exclusive of interest and costs.

6. Venue is proper in this District under 28 U.S.C. § 1391, in that ACS is a Delaware corporation.

FACTS

Hesco's Technology

7. Hesco's Concertainer units have been a key component in providing force protection since the 1991 Persian Gulf war. Subsequently it has been deployed with U.S., NATO, United Nations and other Allied military forces throughout the world. Hesco's products are extensively used to protect U.S. Armed Forces personnel, vehicles, equipment and facilities in military, peacekeeping, humanitarian, and civilian operations. Hesco's Concertainer units have become the most popular means of force protection within the military. It has also proved a valuable resource in combating floods and other natural disasters.

8. Hesco has grown substantially and it now has three manufacturing sites, all producing Concertainer units to ISO International Standards. Hesco's Concertainer units are one of the UK's most successful defense exports.

9. Hesco's Concertainer units are products that are easily and rapidly constructed to create effective and economical protective structures. Long since adopted as an alternative to conventional field fortification materials such as sandbags, Hesco's Concertainer units can be built to any length and to any required height, given the capability of the available equipment and appropriate ground space. Rapid construction is a key feature of the product -- a typical wall of Hesco's products, equivalent to a wall of approximately 1,500 sandbags, can be erected and filled by two men and a single common loader in less than twenty minutes. An equivalent wall constructed of sandbags would take ten persons approximately seven hours to build.

10. Hesco's Concertainer units can be filled with almost any infill material, such as sand, rubble, rocks, and available soil. The ideal fill is a sand/gravel mix.

11. The flat-pack design of the Concertainer units allows for extremely efficient storage and transportation. Folded units can be packaged on standard timber skids or pallets, in standard sea-freight containers or as bulk cargo.

12. Hesco's Concertainer products are supplied as prefabricated and linked baskets of varying sizes made of galvanized steel welded mesh and lined with a geotextile to retain the fill material. It is delivered flat-packed on timber skid/pallets for ease of handling by mechanical equipment. It can be extended using provided joining pins, and filled using minimal manpower and commonly available equipment. Units may be joined and stacked in various configurations to provide effective and economical structures tailored to the specific threat and level of protection required. Generally, protective structures will be designed to protect against ballistic penetration of direct fire projectiles, splinters, and shaped charge war heads, and the blast effects of explosions in proximity to the structure. In most cases, effects will be combined as in the case of a bomb or artillery round which produces significant blast as well as fragments from the burst casing. Protection is afforded by the fill material of the structure as a consequence of its mass and physical properties.

13. The following photograph is an example of Hesco's product in use in Iraq:

Hesco's Intellectual Property Rights

14. Hesco owns the entire right, title and interest to U.S. Patent No. 5,333,970 ("the '970 patent"), issued to James W. Heselden on or about August 2, 1994, entitled "Building and shoring blocks." A copy of the '970 patent is attached as Ex. 1 and incorporated by reference. Hesco also owns foreign equivalents to that patent.

15. Hesco owns the entire right, title and interest to U.S. Patent No. 5,472,297 ("the '297 patent"), issued to James W. Heselden on or about December 5, 1995, entitled "Building and shoring blocks." A copy of the '297 patent is attached as Ex. 2 and incorporated by reference. Hesco also owns foreign equivalents to that patent.

16. Hesco marks its product literature with one or more of its U.S. patents and foreign equivalents.

17. Hesco owns the entire right, title and interest to the trademark "Mil", serial number 78574318, registration number 3219415, filed February 24, 2005, a copy of which is attached as Ex. 3 and incorporated herein by reference. Hesco uses the "Mil" trademark in its business and it has substantial goodwill in the trademark.

ACS

18. ACS' business address in the United States is a private residence.

19. ACS makes, offers for sale and sells "Milibastions® Patented Defense Systems" products ("Milibastion products") for force protection. In addition, ACS contributes to and induces the use by others of its Milibastion products.

20. ACS makes available on the internet literature regarding its Milibastion products (http://www.acs-holdings.com/c/document_library/get_file?folderId=7&name=DLFE-8.pdf). A copy of a printout of that literature is attached hereto as Ex. 4 and incorporated by reference.

ACS' literature represents that its Milibastion products are patented. It expressly represents that: "US Patent Pending, Columbian Patent awarded May 2007". It also represents that the Milibastion products are made in the United States and Columbia.

21. ACS has a website, http://www.acs-holdings.com. A copy of a printout of relevant portions of the website is attached hereto as Ex. 5 and incorporated by reference. On the website, ACS offers for sale its "Milibastions® Patented Defense System" products. ACS further represents that:

> The Milibastions® Patented Defense Systems product line has been installed and proven for a number of clients. To date, most of these procurements have been awarded through government sources, specifically with the military related sections of the United States Government, such as NAS [the Narcotics Affairs Section of the U.S. Embassy in Columbia].
>
> These contracts have been processed in Colombia, where we maintain a branch office. However, ACS is now ramping up for the international market, supporting and protecting various entities all over the globe. Currently we are exploring the options of moving our production to the United States.

22. On information and belief, ACS purports to own the right, title and interest to U.S. Patent Application No. 2005/0284080 ("the U.S. application"), entitled "Bastions for force protection and military applications", filed June 29, 2004, by alleged inventors Jorge Enrique Gallego and Cesar Giraldo of Bogota, Columbia, a copy of which is attached as Ex. 6 and incorporated herein by reference. That application is pending before the U.S. Patent and Trademark Office. Hesco's '970 and '297 patents were issued long before ACS filed its U.S. application.

23. One or more claims of ACS' U.S. application would read on one or more claims of Hesco's '970 and '297 patents.

24. ACS' patent marking statement on its literature is an admission that its Milibastion product would be within the scope of one or more claims of its U.S. patent application and Columbian patent. Indeed, if the Milibastion product was not covered by the claims of the U.S. application, ACS would be in violation of the false marking statute, 35 U.S.C. § 292.

25. The ACS Milibastion barrier products offered for sale by ACS fall within the scope of one or more claims of the '970 patent.

26. The ACS Milibastion barrier products offered for sale by ACS fall within the scope of one or more claims of the '297 patent.

27. ACS is not licensed or authorized to use any of Hesco's intellectual property.

COUNT I
(Patent Infringement)

28. The foregoing allegations of this complaint are incorporated by reference.

29. ACS has made, used, sold, and/or offered for sale products embodying the patented invention, thereby infringing, literally or under the doctrine of equivalents, one or more claims of the '970 patent, and will continue to do so unless enjoined therefrom.

30. ACS has contributed to the use by others of its infringing Milibastion products.

31. ACS has induced the use by others of its infringing Milibastion products.

32. ACS' infringement has been willful.

33. Hesco has been irreparably harmed by ACS' acts of infringement and has suffered damages in an amount to be determined at trial.

COUNT II
(Patent Infringement)

34. The foregoing allegations of this complaint are incorporated by reference.

35. ACS has made, used, sold, and/or offered for sale products embodying the patented invention, thereby infringing, literally or under the doctrine of equivalents, one or more claims of the '297 patent, and will continue to do so unless enjoined therefrom.

36. ACS has contributed to the use by others of its infringing Milibastion products.

37. ACS has induced the use by others of its infringing Milibastion products.

38. ACS' infringement has been willful.

39. Hesco has been irreparably harmed by ACS' acts of infringement and has suffered damages in an amount to be determined at trial.

COUNT III
(Lanham Act § 32)

40. The foregoing allegations of this complaint are incorporated by reference.

41. ACS has used in commerce a trademark confusingly similar to Hesco's federally registered "Mil" mark, in connection with ACS' sale, offering for sale, distribution, and advertising of its goods or services. Such use is likely to cause confusion, mistake, or to deceive customers or potential customers.

42. ACS' use has been willful and deliberate.

43. As a result of such unauthorized use, ACS has infringed and is infringing Hesco's trademark rights under Section 32 of the Lanham Act, 15 U.S.C. § 1114.

44. Hesco has been irreparably harmed by ACS' acts of trademark infringement and has suffered damages in an amount to be determined at trial.

COUNT IV
(Lanham Act § 43(a))

45. The foregoing allegations of this complaint are incorporated by reference.

46. ACS' products are used, sold, and/or offered for sale in interstate and foreign commerce.

47. In connection with its goods or services, ACS has used one or more words, terms, names, symbols, or devices, alone or in combination, as well as false designations of origin, false or misleading descriptions or representations of fact, which are (a) likely to cause confusion, or to cause mistake, or to deceive as to the affiliation, connection, or association of ACS with Hesco, or as to the origin, sponsorship, or approval of its goods, services, or commercial activities by another person, and/or (b) in commercial advertising or promotion (including without limitation its website), ACS misrepresents the nature, characteristics, qualities, or geographic origin of its or Hesco's goods, services, or commercial activities.

48. By reason of ACS' statements and conduct, ACS has willfully violated section 43(a) of the Lanham Act, 15 U.S.C. § 1125(a), and Hesco has suffered, and will continue to suffer, damage to its business, reputation, and good will and has lost sales and profits that Hesco would have made but for ACS' acts.

49. Hesco has been irreparably harmed by ACS' acts in violation of the Lanham Act and has suffered damages in an amount to be determined at trial.

COUNT V
(Common Law Trademark Infringement)

50. The foregoing allegations of this complaint are incorporated by reference.

51. ACS' use of Hesco's valuable trademarks constitutes infringement, false designation of origin, false description, and unfair competition under the common law of

trademark infringement. As a result of these practices, customers were confused and mistaken as to the association of ACS and its products with Hesco and its products.

52. Hesco has been irreparably harmed by ACS' acts and has suffered damages in an amount to be determined at trial, in excess of $75,000.

REQUEST FOR RELIEF

Hesco respectfully requests that this Court enter judgment against ACS and that the following relief be granted:

a. judgment that ACS has infringed the claims of the '970 and/or '297 patents (35 U.S.C. § 271);

b. judgment that ACS' infringement of the claims of the '970 and/or '297 patents was willful;

c. injunction against continued infringement (35 U.S.C. § 283);

d. damages for past infringement (35 U.S.C. § 284);

e. imposition of a constructive trust on all proceeds from the sale of accused products;

f. increased and trebled damages for willful infringement (35 U.S.C. § 284);

g. damages for ACS' infringement of Hesco's trademarks, including damage to Hesco's good will (15 U.S.C. §§ 1114, 1125(a));

h. treble damages and statutory damages;

i. a preliminary and permanent injunction against continued trademark infringement;

j. attorneys' fees as allowed by law, including without limitation, 35 U.S.C. § 285 (patent infringement), and 15 U.S.C. § 1117(a) (trademark infringement);

k. costs pursuant to Fed. R. Civ. P. 54(d) or otherwise provided by law; and

l. such other relief as the Court deems just and appropriate under the circumstances.

POTTER ANDERSON & CORROON LLP

By: _____

Richard L. Horwitz (#2246)
David E. Moore (#3983)
Hercules Plaza, 6th Floor
1313 N. Market Street
Wilmington, DE 19899
Tel: (302) 984-6000
rhorwitz@potteranderson.com
dmoore@potteranderson.com

Attorneys for Plaintiff
Hesco Bastion Limited

OF COUNSEL:

Richard J. Oparil
PATTON BOGGS LLP
2550 M Street, NW
Washington, DC 20037
(202) 457-6000

Scott Chambers, Ph.D.
Kevin M. Bell
PATTON BOGGS, LLP
8484 Westpark Drive, Ninth Floor
McLean, Virginia 22102
(703) 744-8000

Dated: May 5, 2008
862991 / 32869

US005333970A

United States Patent [19]

Heselden

[11] **Patent Number: 5,333,970**

[45] **Date of Patent: Aug. 2, 1994**

[54] **BUILDING AND SHORING BLOCKS**

[75] Inventor: **James W. Heselden**, Leeds, England

[73] Assignee: **Hesco Bastion Limited**, Leeds, England

[21] Appl. No.: **776,268**

[22] PCT Filed: **Apr. 2, 1990**

[86] PCT No.: **PCT/GB90/00485**

§ 371 Date: **Nov. 26, 1991**

§ 102(e) Date: **Nov. 26, 1991**

[87] PCT Pub. No.: **WO90/12160**

PCT Pub. Date: **Oct. 18, 1990**

[30] **Foreign Application Priority Data**

Apr. 7, 1989	[GB]	United Kingdom	8907832.3
Jul. 10, 1989	[GB]	United Kingdom	8922639.3
Oct. 24, 1989	[GB]	United Kingdom	8923934.7
Jan. 20, 1990	[GB]	United Kingdom	9001376.4

[51] **Int. Cl.**[5] **E02D 29/02**

[52] **U.S. Cl.** **405/286**; 405/32; 405/258

[58] **Field of Search** 405/15, 16, 19, 21, 405/30, 32, 258, 284, 286, 287, 287.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,011,728	3/1977	Turzillo	405/222
4,394,924	7/1983	Zaccheroni	405/32 X
4,483,640	11/1984	Berger et al.	405/15
4,572,705	2/1986	Vignon .	
4,726,708	2/1988	Papetti	405/19

FOREIGN PATENT DOCUMENTS

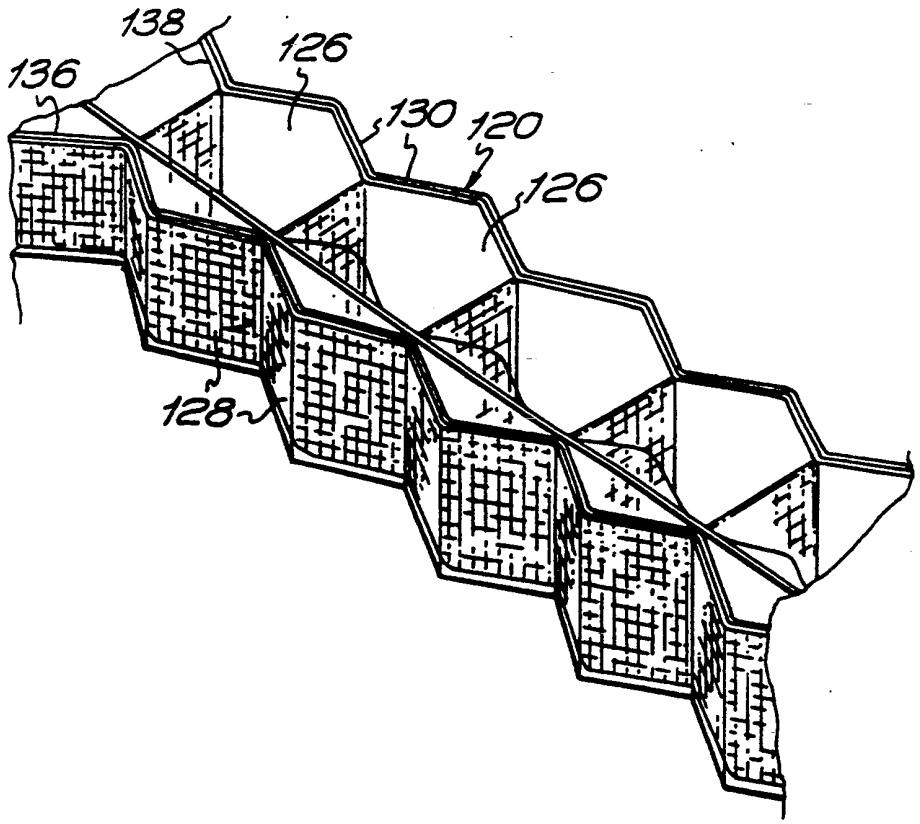
968726	6/1975	Canada	405/32
2526127	11/1983	France .	
845863	8/1960	United Kingdom .	

Primary Examiner—David H. Corbin
Attorney, Agent, or Firm—Klauber & Jackson

[57] **ABSTRACT**

The invention provides that wire mesh cage structures are used to provide structural blocks usable in building, shoring, walls and the like. The cage is lined with a geo-textile fibrous material which allows the passage therethrough of water, but not particulate material such as cement, sand aggregate which are used as materials for filling the cage. The invention descloses novel forms of cage structure and also that the finished blocks can be coated with curable synthetic resin to conceal the mesh and provide a decorative surface finish.

26 Claims, 5 Drawing Sheets



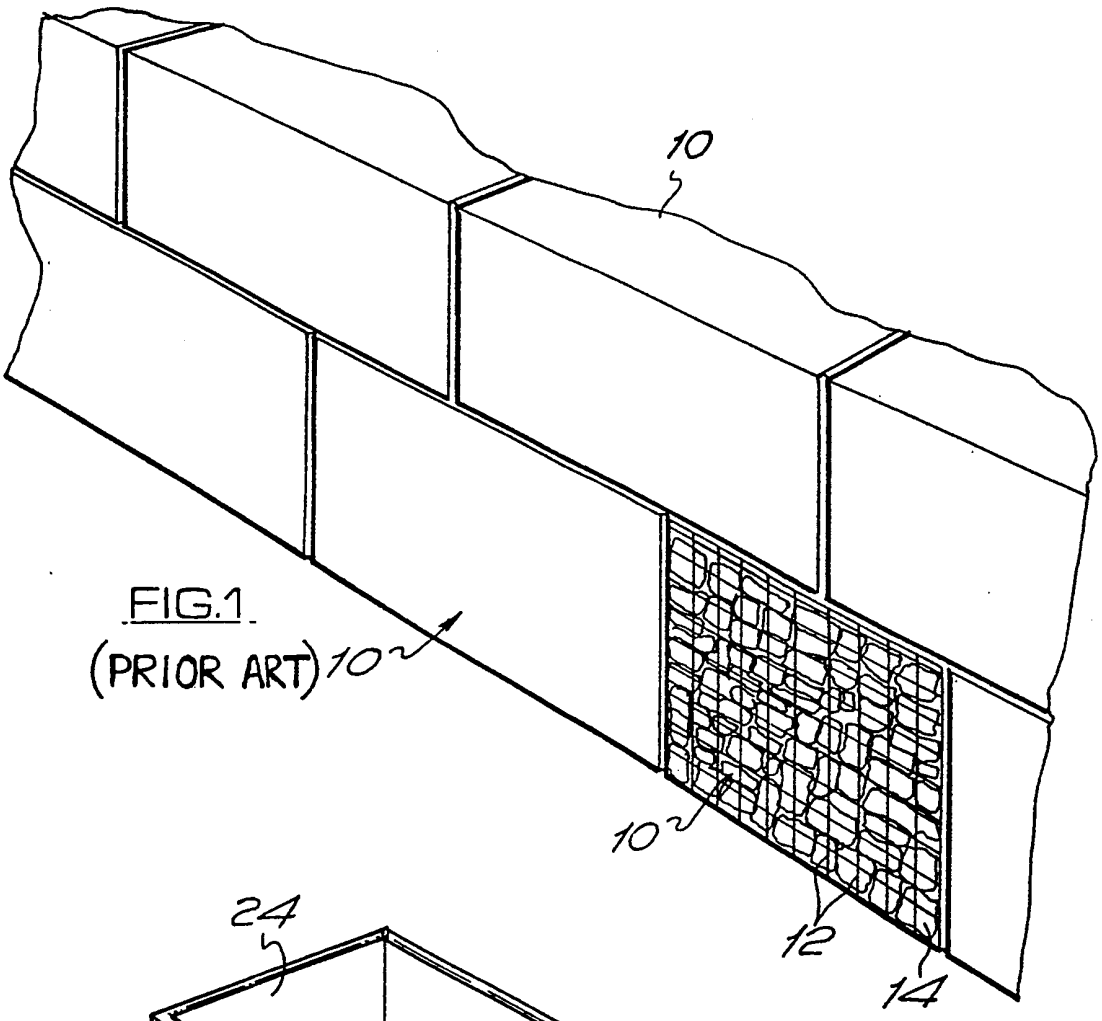


FIG.1
(PRIOR ART)

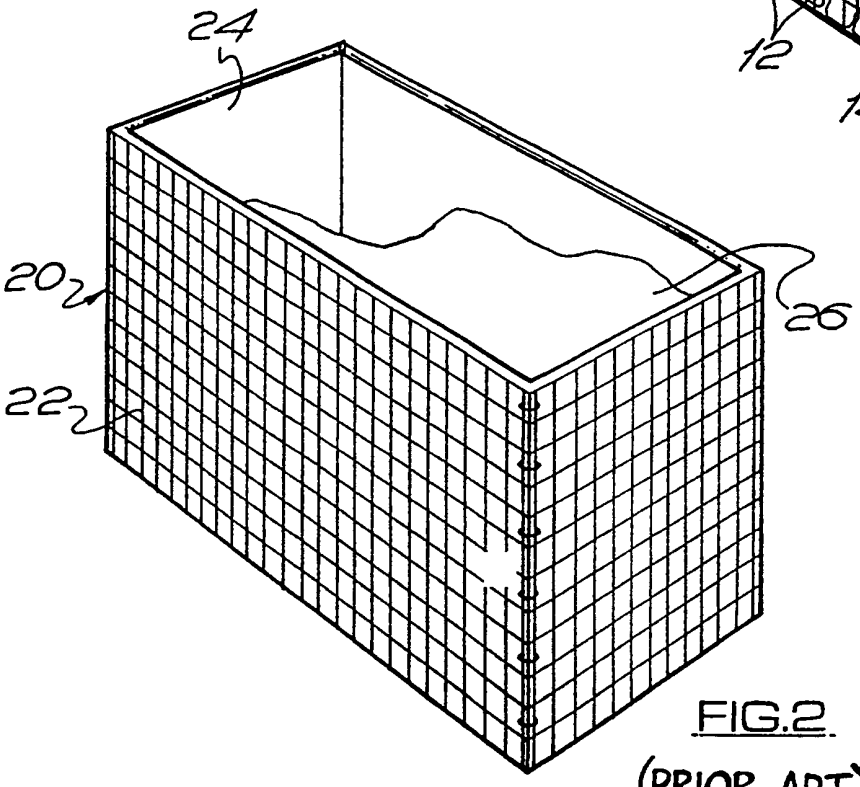


FIG.2
(PRIOR ART)

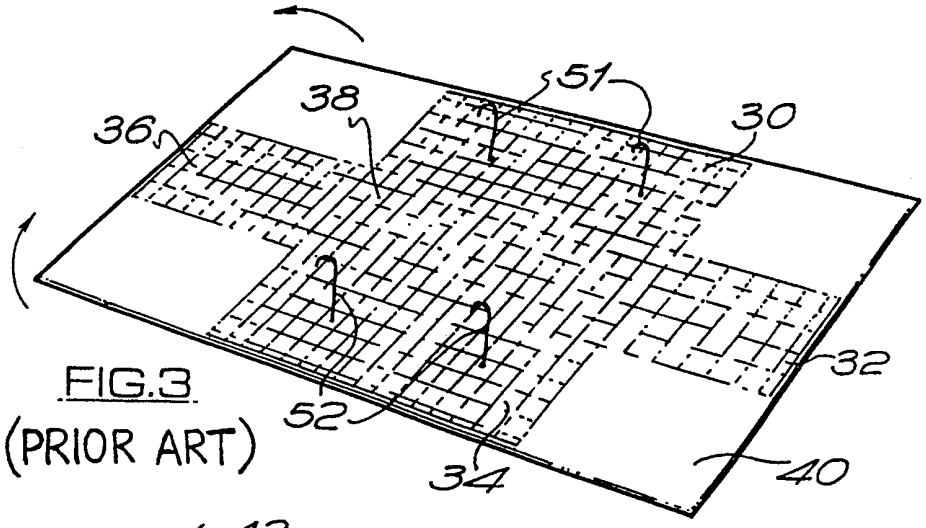
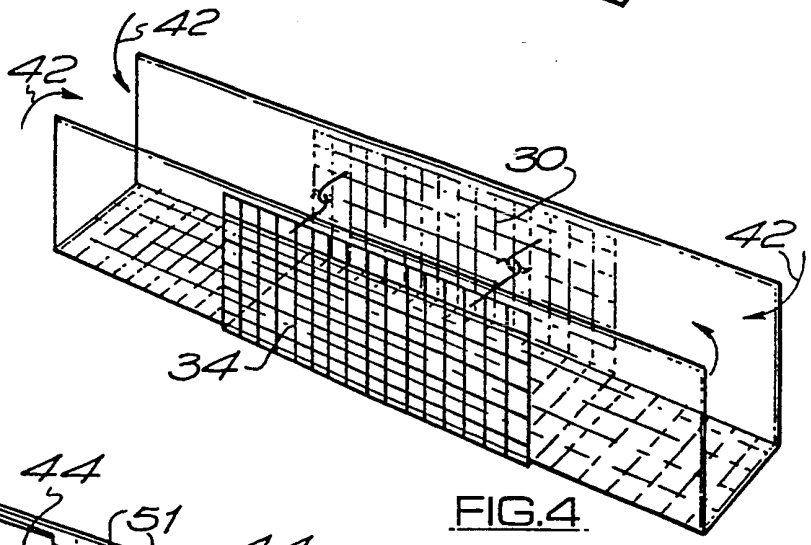


FIG.3
(PRIOR ART)



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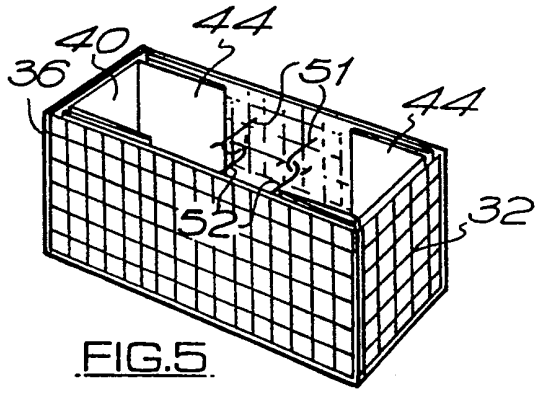
(PRIOR ART)



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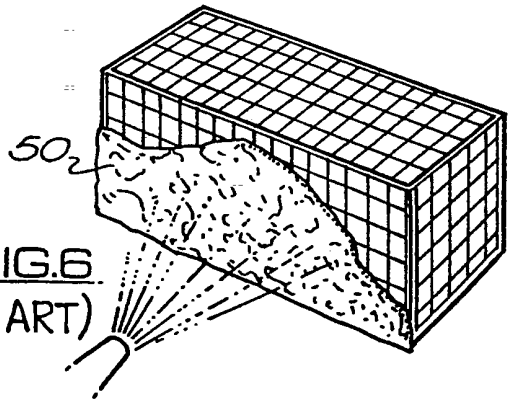

FIG.6
(PRIOR ART)

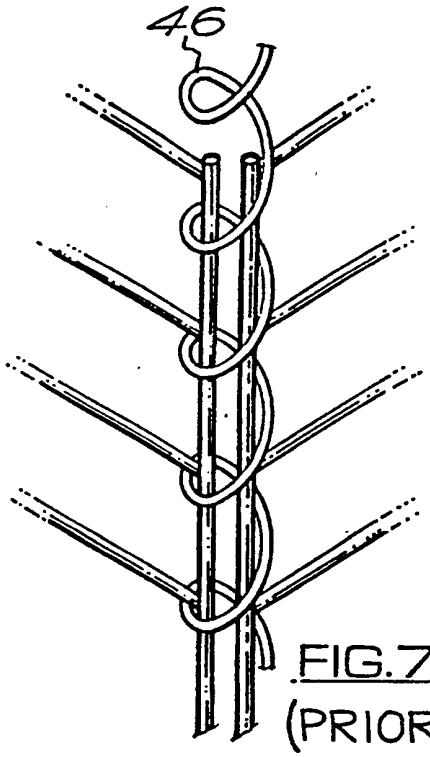

FIG.7
(PRIOR ART)

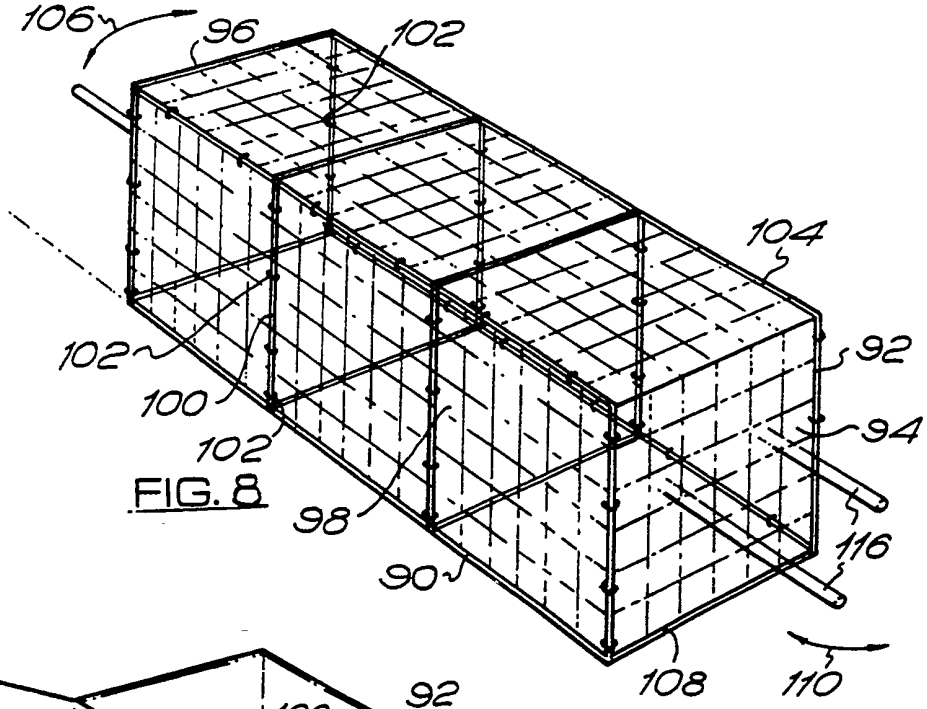

FIG. 8

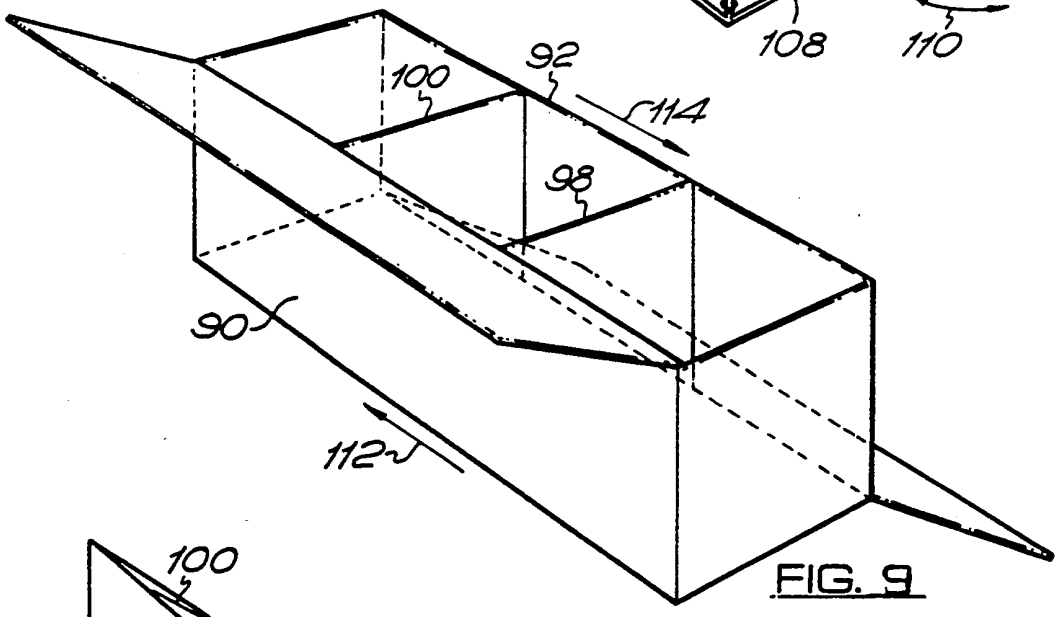

FIG. 9

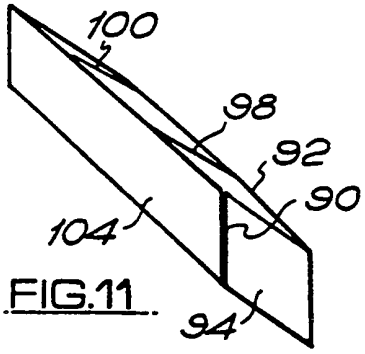

FIG.11

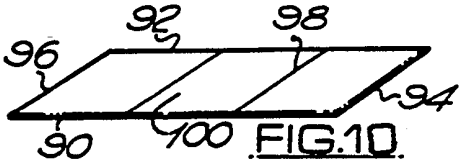

FIG.10

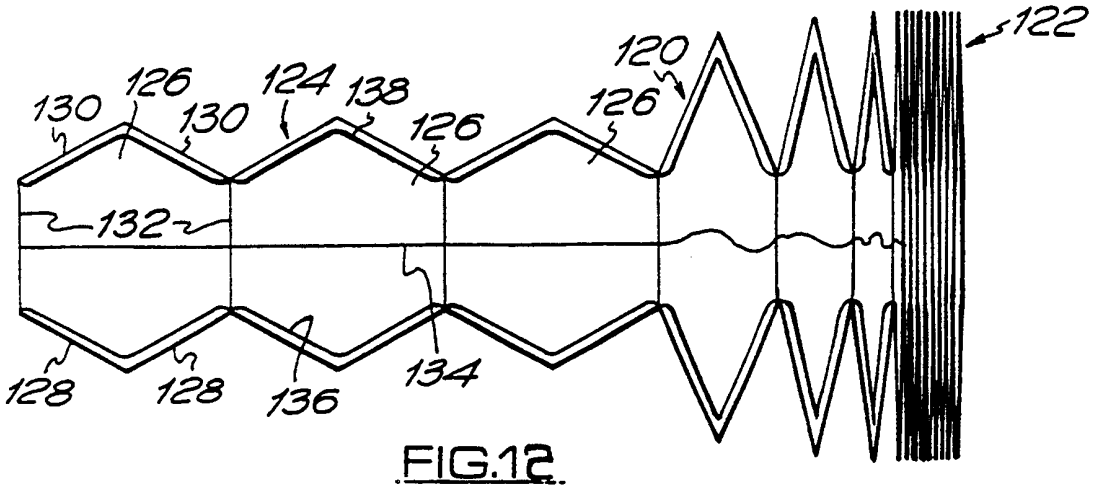
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FIG.12

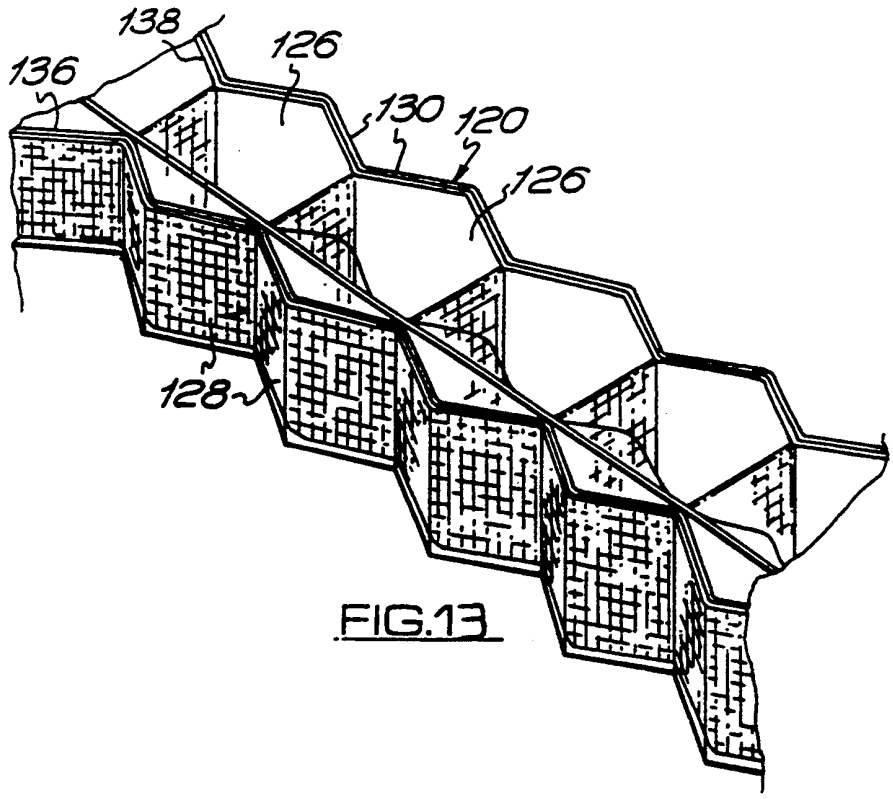
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FIG.13

BUILDING AND SHORING BLOCKS

This invention relates to building and shoring structures in the form of blocks, and in particular concerns building and shoring blocks which comprise a metallic mesh cage which is filled with ballast material.

Certain of each structures are known by the name "gabions" and comprise essentially wire mesh cages defining a block shape, which are filled with rock, stone and rubble and the like. The stone is generally placed immediately inside the cage surface so as to be visible through the cage, and in this connection the stone typically is dressed and laid in the nature of a wall so as to have an enhanced appearance, as frequently the stone surfaces are left exposed to view. This may apply for example when the gabions are used, as they are extensively, for the shoring up of an embankment for example adjacent a motorway or for forming a sea defence or the like.

Although these gabions are made up of wire mesh cages filled with stone and other rubble, in effect they become solid blocks which can be used for building, shorings for hillsides, sea walls and the like, for walls and for other purposes.

However, the method of filling the wire mesh cages in using facing stone is expensive, and furthermore considerable time and effort is required in filling the gabion cages. Obviously the stone and other rubble is required in accordance with the conventional method of construction, because otherwise the material would simply pass through the meshes of the wire mesh cage.

In the instant invention however, structural blocks, which can be used as gabions and for other purposes are provided whereby a much looser particulate, fluent material such as sand, concrete, ash and soil colliery waste and small particular aggregate can be used as the ballast material either singly or in combination with other material without the disadvantage of the known gabion structures arising, and furthermore the gabion cages can be easily erected on site to facilitate completion of the site work. In accordance with the invention in a first aspect there is provided a method of providing an on site structural block comprising transporting to the site a flattened cage comprising pivotally interconnected panels of open work mesh and which is erectible to the shape of the block to be provided by moving the panels apart, erecting the cage, including applying to the panels before or after erection so as to at least partially line the interior of said cage, flexible sheet material, and filling the cage at least partially with fluent solid material of a particulate nature which, but for the lining material, would pass through the meshes of the cage. The fluent solid material can in fact be any of a wide range of materials. Thus it may be mixed with water and pumped into the cage which may or may not as required allow the water to escape leaving a solid mass of small particles as the infill. Again, synthetic resin systems which may be foamable or not can be used, such systems being of a nature which are liquid when poured into the cage and solidify and fill the cage interior to form the ballast.

The flexible lining material may comprise a flexible fabric, met or a plastic film, or metallic foil or a laminate or a combination of materials, but in any event it simply forms a barrier layer whereby the ballast will be retained inside the gabion mesh even if the ballast material is something which is as loose and as small in particulate size, as builders sand. The barrier layer may be a pre-impregnated fibrous mat or felt or the like which cures hard after positioning in the cage.

By this arrangement, when the invention is used for gabion cages, the flexibility of use of gabion structures is considerably increased, because the range of ballast materials which can be used is substantially increased. It is usual for example for quantities of sand or other particulate material to be more readily available than dressed stone.

To further enhance a gabion structure according to the invention, it may after it has been placed in operative position be oversprayed or coated by means of a curable synthetic composition, for example a polyester or epoxy resin composition to fully cover the wire mesh to prevent corrosion from hostile atmospheres and which resin composition may or may not be provided with glass fiber reinforcement and/or coloring for enhancing the overall effect. Such resin material when cured can be arranged to anchor aggresively to the wire mesh cage structure and also the barrier layer, especially when the barrier layer is a pre-preg, thereby in fact somewhat concealing the gabion from view and creating a pleasant appearance. The application of the synthetic resin may be by spray or the like, and the resin can be applied in any appropriate quantity. The barrier layer may be absorbent in nature so as to soak up at least some of the resin.

The invention also applies to the formation of concrete structure such as footings, ring beams, columns, bases, and generally any structure or formation including concrete or concrete like material, with or without steel reinforcement, and in using the present invention in this regard the utilization of conventional concrete shuttering can be eliminated.

When casting a concrete structure, it is necessary to provide shuttering, which may be in the form of boards or plates shaped to form a cavity to be filled with the concrete in order to form the eventual structure. The provision of such shuttering is time consuming and costly, and if timber shuttering, which is the most popular type, is used, then invariably skilled Joinery craftsmen are required to erect the shuttering prior to the pouring of the concrete.

Concrete footings are used extensively in the erection of buildings, especially tall buildings, such as office blocks, and such footings have to be set into the ground, usually under ground level to take the anticipated massive building loads.

When the ground is excavated for the provision of such footings, the erection of shuttering at under ground level is complicated.

In accordance with a preferred feature of the present invention therefore, a concrete structure is produced by filling the cage at least partially with concrete to form the concrete structure, and the flexible sheet material is water porous having the characteristic which allows water to pass therethrough but prevents the concrete from exuding through the mesh when poured into the cavity.

By this means and method, concrete structures can be formed rapidly and readily. The cage form the support for the concrete as it is poured into the cavity, whilst the said flexible sheet material forms a means for allowing the water quickly to percolate from the poured concrete and to enhance the setting speed of the concrete.

When compared with the conventional shuttering method several highly significant advantages result.

Firstly, when concrete is poured into a cavity defined by conventional shuttering, moisture in the concrete can escape from the mix only through the surface of the body of concrete and, therefore, the curing rate is slow. With the instant invention, however, the water immediately starts to percolate through the lining material so that curing commences immediately, and final curing takes place at a faster rate. Secondly, the cage can, especially where the concrete structure is a footing which will be underground and will be covered in the final building in which it is embodied, can remain with the cast concrete, and it is not necessary to erect and remove shuttering as in the conventional shuttering method. Thirdly, the cage can be pre-formed under factory conditions, and it is not necessary to erect shuttering on site; therefore, it is not necessary to have skilled joiners on site, who may in inclement weather in any event be unable to work, which can delay the completion of the project.

It is preferred that where the cage forms a side wall to support the poured concrete, that there should be reinforcing restraining means which may be in the form of a partition restraining the cage walls from bowing or bulging outwardly under the gravitational effect of the poured concrete. It may be possible to mitigate the need for this restraining means if the concrete is poured into the cavity sequentially and at intervals so that a first layer of concrete is poured into the bottom of the cavity and after a predetermined time when the concrete has been given an opportunity at least partially to set a second layer of similar thickness is deposited in the cavity, and this procedure is repeated until such times as the cavity has been filled to the required extent. By this arrangement, the partial rigidity of the previously poured layer of concrete assists in maintaining the side wall or walls of the cage means in the correct configuration.

The poured concrete may be vibrated for the homogenization and leveling of same in accordance with conventional practice.

The utilization of the cage and flexible sheet material to form the support for the poured concrete means that, as indicated above, the cage can be pre-fabricated to any desired shape, and as the cage is of a type which is collapsible to a flat condition making it suitable for transportation to the site, it can be easily erected and filled on site by relatively unskilled personnel.

If the cage is provided with internal partitions, these partitions can be used, if they are of mesh construction, for suspending steel reinforcement bars in predetermined position, and therefore the partitions can serve two purposes one of which is to keep the cage walls in desired position and the other of which is to support reinforcement rods.

The said material is preferably the known geo-textile material sold by Dupont and I.C.I., and which is designed to allow water to pass through the material, but to prevent solid particles which are in a pasty condition from exuding through the material, even although pressed strongly

The present invention also applies in another aspect to a cage structure for use in providing structural blocks, and in accordance with this aspect of the present invention there is provided a cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising pivotally interconnected panels of open work mesh which is moveable from a flattened condition to an erected condition by moving the panels apart, and a lining material lying to theinside of said open work mesh to enable the cage to be filled with a particulate material which would pass through the open work mesh were it not for the presence of the lining material.

Preferably, said lining material is connected to the insides of the panels forming the walls of the cage and folds with the folding of the cage panels between the collapsed and erected conditions.

Also, it is preferred that the cage when erected is of rectangular configuration defining side walls, end walls and a base, the base being pivotally connected at one side to the lower edge of one of the side walls, and the side and end walls being hingedly interconnected at the corners of the rectangular configuration.

There may be intermediate partition walls extending between said side walls.

According to a further preferred feature, the cage comprises hingedly interconnected side panels defining said walls and transverse partition panels interconnecting the side walls, said cage being movable between a collapsed condition in which the axle panels are folded concertina fashion and an erected condition in which the side panels and partition panels form a row of cavities, said lining material lying to the inside of said side panels.

The lining material is preferably a geo-textile felt material.

The cage structures according to yet a further aspect of the invention can be utilized for conventional gabion structures and in accordance with this aspect there is provided a cage structure-for use in providing a structural block comprising pivotally interconnected open work mesh panels which provide cage walls and are pivotally interconnected so as to be movable between a collapsed condition and an erected condition, in which latter condition the cage structure defines one or more cavities to be filled with building materials.

Such a cage is simply erected at the site by relative pivoting of the panels, and then the erected structure is filled adjacent the panels at least with the filling material being stones, rocks, boulders or the like which are individually larger in dimension than the dimensions of the apertures in the open work mesh.

It is known to provide gabion cages in the form of flat blanks made up of portions which are pivotally interconnected so that the cage can be erected on site, but such known cage structures comprise a base panel with side panels hinged to the edges thereof. On site, the side panels are hinged to vertical positions, and the meeting vertical edges of adjacent sides are connected by suitable clips which are applied by means of an application gun, thereby to create the gabion box structure which has an oven top. The thus constructed gabion cage is then filled with the filling material.

One shortcoming of such a cage is that the clips must be applied by a power gun on site, which is undesirable, because it requires the provision of power on the site which has its own inherent problems, and secondly, when such a gabion cage is loaded i.e. filled with filling material, there is an outward pressure on the sides which concentrates on the said clips, and if the clips are not therefore properly and securely applied, then failure of the clips can and does take place.

Preferably, the cage structure defines two side walls and two end walls which are pivotally interconnected

at the corners, and a base panel pivotally connected to a lower edge of one of the side panels.

With the preferred gabion cage structure in accordance with the present invention, the sides of the gabion cage are hingedly interconnected under factory conditions, and a base is hinged to one only of the sides so that for transportation, the cage can be collapsed by relative pivoting of the sides, parallelogram fashion, and the base can be folded over onto the flattened sides.

If the cage has internal partitions, these can also be pivotally connected to opposite sides when the cage is constructed under factory conditions. By constructing the cage under factory conditions, it is easier to ensure that the applied clips will be effectively applied so as properly to perform the function of holding the gabion cage sides together.

On site, the cage is simply erected by unfolding the base and moving the sides to the erected condition - The remaining sides of the base may be clipped to the other sides of the gabion cage structure if necessary, but as will be understood from the nature of filling of the cage, the Joint between the base edges and the s ides is not required to be as high in strength as the Joints between the adjacent sides and partition panels.

The gabion cage may also be provided with a top panel, of similar size to the base, but hinged when factory constructed to the side opposite the side to which the base is hinged.

In another embodiment of such a cage, in the cage structures a plurality of pivotally interconnected side panels form the side walls, and the side walls are connected by partition panels which are pivotally connected thereto, and the cage structure can be moved to a collapsed condition wherein the side panels are folded concertina fashion and a flexible cord is connected to the partition panels and serves as a means for erecting the cage structure by pulling on said cord to cause the cage to erect to a forth defined by a plurality of subcages arranged in a row.

Gabion cages constructed in accordance with this aspect of the invention do not require the utilization on site of power tools for the application of connecting clips as the applied clips which connect the base and sides and top of sides if a top is provided can be of a type which is applied by hand.

Another advantage of the cage according to this aspect of the present invention is that it can be provided under factory conditions with partition panels. The conventional erectible gabion cage requires to have the partition panels connected on site.

In accordance with yet a further aspect of the present invention a cage structure can be fabricated under controlled conditions e.g. factory. conditions, so that it has a flattened or compressed minimun volume form, and then can be moved to erected condition on site and filled on site to form a shoring or building structure or the like, the gabion cage structure being characterized in that in the flattened or compressed form its side walls are concertina folded.

The cage structure may be used in conjunction with a flexible member such as a rope or cable connected to respective panels of the structure to limit the extent to which it can be opened, so that for example the resulting opened out cage structure will have a particular form.

In one embodiment of this aspect of the invention, in the opened out form the cage structure is elongated and is made up of polygonal cavities arranged in a row, with one panel being common and defining a side of each cavity of adjacent polygonal cavities. The cavities preferably are hexagonal in shape and the common panels are partition or diaphragm panels, whilst the remaining panels, four to each cavity, define the sides of the elongated structure.

The said flexible member when provided preferably is anchored to the partition panels to limit the extent to which they can be moved apart as the collapsed structure is moved from the flattened or compressed condition to the fully opened condition.

The cage structure preferably is associated with lining membrane means, and preferably such means comprises lining material lying to the inner sides of the side panels. The membrane means preferably comprise two elongated strips of the lining material which lie to the inner sides of the side panels and extend for the length of the structure. In this connection the partition panels have to be coupled to the side panels by a means which passes through the lining strips.

The panels are preferably of open work wire mesh.

Such fastening means may as disclosed above comprise clips or the like.

The blocks according to the invention can be used for earth shoring purposes and when sprayed with the resin composition will provide attractive wall surfaces. Alternatively, the blocks can be used for providing barfacades, temporary accommodations, army compounds, shelters for defence against attack, sea defences and any of a large nun%her of building structures which can be created using building blocks.

The flexible barrier layer when used to separate the filling material from the cage structure may be any suitable, but we have found that the bonded fabric felt materials of the geo-textile nature have been particularly suitable.

Embodiments of the invention, and the advantageous features thereof, will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. **1** shows in perspective elevation a shoring wall formed from gabions of conventional construction;

FIG. **2** shows a gabion with a cage of known construction;

FIGS. **3**, **4** and **5** show a method of constructing a gabion using the cage of FIG. **2**;

FIG. **6** shows how the gabion of FIG. **2** may be coated to provide a decorative, protective finish;

FIG. **7** illustrates a spiral clip usable for interconnecting panels of the gabion cage shown in FIG. **2**;

FIG. **8** shows a cage according to the invention which is useful in preparing the concrete structure in bar or block form;

FIG. **9** shows the cage structure of FIG. **11** in an alternative position;

FIGS. **10** and **11** show how the cage means of FIG. **11** may be folded to a collapsed condition.

FIG. **12** is a plan view of a gabion cage structure according to another embodiment of the invention which is being moved from the flattened compressed condition to the erected condition; and

FIG. **13** is a perspective view of the cage structure of FIG. **1** in the erected condition.

Referring to FIG. **1**, conventional gabions **10** are in the form of massive blocks defined by metal wire mesh cages **12** in which are contained stones **14** and other rubble. The filling material for the cages at the wire mesh panels is of a size such that it will not pass through

the meshes of the cage. The wires of the cage may be uncoated or coated with protective plastics material.

The use of gabions for wall structures, shoring walls, barricades, coastal supports is well known. The use of gabions effectively combats erosion and they are particularly suitable for stabilizing and strengthening embankments. The gabion cages are filled on site by relatively unskilled labor but they still require the use of fairly large dimension filling stones. Gabions have the advantage that they do have some flexibility to allow some movement and change in shape should local ground subsidence occur. Their strength and integrity are retained. The gabions furthermore are porous and it is not therefore normally necessary to incorporate drainage systems.

FIG. **2** shows a gabion with a known cage, and it will be seen that the gabion **20** comprises a gabion cage **22** of steel rods or wires as in the conventional gabion **10**, but in addition the steel cage is lined by flexible lining material **24** which enables the gabion to be filled entirely with a ballast material of a considerably smaller particle size. For example sand can be used as the ballast material. This enhances the utility of the gabion structure. The gabion shown in FIG. **2** is illustrated as being partially filled with sand or like loose material **26**. In practice when the gabion is filled, it will be closed by means of a wire mesh lid, and s/anilarly a layer of the flexible material **24** may be placed over the filling. The flexible sheet material which is used as the covering may be any suitable, but we have found that bonded felts of synthetic fibers which are of considerable tensile strength, but are porous so as to allow liquid to pass therethrough, but not the particular ballast material, are particularly suitable.

According to a preferred feature, when the gabion **20** has been filled and liddad, and is in position in a wall or shoring structure, the exposed faces are then sprayed with a curable synthetic resin composition **50** as shown in FIG. **6** in order to form a relatively even and textured surface over the metal cage, to give the appearance for example of a rough cast wall. The reel which is used subsequently cures and forms an aggresive bond with the sheet material **24** and the metal cage **22**. The sheet material is absorbent and soaks up the resin so forming a good bond.

In the known gabion structures, the metal cage is laid out as a blank and is folded to erected condition, the adjacent edges of the panels being clipped together with stainless steel clips or galvanized spring steel ring clips or helical binders. In the arrangement illustrated in FIGS. **3, 4** and **5**, the wire mesh panels **30, 32, 34, 36** and **38** making up the cage blank are suitably secured together so as to be relatively hingeable, and the blank is covered by means of a sheet **40** of the said flexible material, which is secured to the said panels. To erect the cage and the sheet material **40**, initially panels **34** and **30** are folded to the position shown in FIG. **4**, following which the excess portions of the material **40** at the corners are tucked inwardly as indicated by arrows **42**, and then the end panels **32** and **36** are turned upwardly until the position shown in FIG. **5** is reached, the said extra portions of the material **40** forthing flat fillets **44**. The cage is now ready for filling with the filling material which may be loose particulate material such as sand. FIG. **7** shows how a helical spring binder clip **46** may be used for connecting the ends of the respective panels, but any suitable connecting device can be used.

The gabion shown in FIG. **5** after filling with the ballast material may be closed by means of a wire mesh lid panel as in the conventional arrangement.

It is to be noted from FIGS. **3, 4** and **5**, that connected to the panels **30** and **34** are tie hooks **51** and **52**. These hooks link with each other as shown in FIG. **4** when the panels **30** and **34** are erected, in order to keep the panel s connected whilst the material **40** is tucked at the comer and then the panels **32** and **36** are folded to the upright position. The use of the ties to hold the panels **30** to **36** together at the corners effects completion of the structure ready for filling.

Again as with the gabion shown in FIG. **2**, the exterior of the gabion or that portion which is visible can be sprayed with a curable synthetic resin in order to form a decorative finish, and in addition to protect the sheet material **24** in the case of FIG. **2**, and **40** in the case of FIG. **5**.

Where the gabions are coated, it may be desirable to ensure that the gabions remain permeable to water to ensure that water can drain through the gabions as happens with the conventional gabions.

The sheet material serves to permit the use of much finer particles as ballast material. Also soil and ash can be used as ballast material, and these materials by and large tend to be much more readily available than the conventional materials such as brick, broken concrete, granite, limestone, sandstone, shingle and s lag and stone as used in the conventional gabions.

The gabions may be filled on site by any suitable means such as hand shovels, augers, pumps, earth movers of various types, making filling much quicker than the method used for conventional gabions.

The gabions described have a number o f advantages including the following:

Wet sand or pebbles pumped by a suitable pump can be used as the gabion infill material especially when the site is a beach area.

The gabions can be finished cosmetically by the use of the coatings.

The coatings can be selected to be resistant to chemical, salt water, mineral, wind, rain and send attack.

The gabions can compete effectively with equivalent concrete structures.

Reference is now made to FIGS. **8** to **13** which illustrate the application of the invention to the production of concrete structures.

To form a concrete structure using the cage according to the invention it is simply a matter of filling the interior of the cage with concrete. The concrete may be charged into the cavity in layers until if required the cage is filled. When each layer of concrete is poured into the interior, it is allowed to stand for a predetermined period of time so that the concrete will initially set. As soon as the concrete is charged into the interior of the cage the water percolates through the lining material and through the mesh, so that in effect drying of the concrete takes place much quicker than it would do in conventional shuttering as the water can escape from the concrete using a conventional shuttering method only from the top surface. With this method, therefore, the concrete cures quicker and the subsequent layers can be applied so that the cavity is filled quicker than with conventional shuttering. In addition, for the conventional shuttering of cylindrical concrete structures special curved fibreglass molds must be used, and retainers and reinforcing have to be fitted inside the molds. The erection of molds on site is time consuming

and requires skilled personnel. The provision of a simple cage with the lining material provides a much simpler method of shuttering the concrete.

When the concrete has cured, the mesh cage can remain connected to the concrete or it can be removed if required, and to some extent this will depend upon whether or not the exterior of the concrete structure in the final building or other location in which it is used is visible. If it is not visible there is no need to effect any additional treatment to the exterior of the concrete structure, but if it is visible, it can be treated by shot-blasting in order to remove the lining material, followed by a spraying of the structure by the thermo-setting resin composition, as such thermo-setting resin composition will form a better bond to the concrete than it will do to the lining material.

The mesh cage in conjunction with the lining material provides an effective shuttering means for concrete which is much simpler to handle and construct and is easier to form into the required shape.

FIG. **8** shows a form of cage according to the invention which is suitable for providing concrete structures in the form of blocks or beams. The cage is provided with sides **90** and **92**, ends **94** and **96**, cage partition panels **98** and **100**, each of these components being of a wire mesh construction. The respective parts are hinged together by means of clip hinge rings **102** which enable respective portions to be relatively hinged so that the inter-connected portions can be relatively hinged to a flattened condition, as shown in FIG. **11**. Thus, the top **104** can be hinged as indicated by arrow **106** relative to the side **90**, as the base **108** can be hinged as indicated by arrow **110** relative to the side **92**. The sides **90** and **92** can be displaced relative to each other as indicated by arrows **112** and **114** in FIG. **9**, so that the sides **90**, **92**, the end panels **94** and **96** and the partition panels **98** and **100** move to a flattened condition as indicated by FIG. **11**. When these panels and walls are so moved to the flattened condition the top **104** and bottom **108** can be swung onto the outsides of sides **90** and **92** to provide the flattened assembly.

Such a cage can obviously be readily manufactured under factory conditions and transported to site where it is filled with concrete. It should be mentioned that the inner surfaces of the sides **90** and **92** and the inner surfaces of the ends **94** and **96** will be lined with the material **68** in order to contain the concrete. If appropriate, the base and/or top inner surface may also be lined with this material.

A concrete block or beam can be formed simply by filling the cage shown in FIG. **8**, when of course the top **90** will be open and this top will be closed when the cage has been filled with concrete. The inside of the top **90** can also be lined with material **68** if required, but it is felt that this will be unlikely.

The same benefits are achieved concerning the curing of the concrete as are achieved as described herein, and FIG. **8** also shows how reinforcement steel bars **116** will be supported on the ends **94** and **96** and also on the partitions **98**, **100** simply by being passed through the mesh apertures in these components and no additional location means is required for the reinforcing bars. As many reinforcing bars as required may be utilized in connection with the cage.

Again as described herein, the material **68** may be sand-blasted so as to remove same and the resulting concrete structure may be covered by means of the thermo-setting resin.

The concrete structures constructed in accordance with this embodiment of the invention may be used in any suitable application, such as foundations, ring beams, bases, columns, steps, retaining walls and in any application where shuttering is normally required.

Concrete blocks housed in cages may be used for breakwaters, or sea walls, as described herein.

The clip rings **102** may be simple coiled lengths of steel which can-readily be applied to the cage bars by hand.

The invention also provides a collapsible cage structure for use in connection with the method.

Another advantage of this aspect of the invention is that relatively wet concrete can be used in the process of producing the concrete structures because of the rapid expression of the water from the concrete when the concrete is poured into the cage. Because the concrete is relatively wet, air bubbles therein can escape readily giving more homogeneously cured concrete. This compares significantly with the prior art when shuttering is used for forming concrete structures, because in such case there is usually a requirement for the concrete to be delivered in a relatively dry condition e.g. 75 slump. It is more desirable to have the concrete relatively wet, but the disadvantage of this is that relatively wet concrete is more difficult to work with in a shuttering method. No such difficulty arises in accordance with the method of this aspect of the present invention.

Reference is now made to FIGS. **12** and **13** which show a particularly suitable form of cage according to another aspect of the present invention.

Referring to FIGS. **12** and **13**, a sage structure **120** as shown in FIG. **12** is adapted to have a flattened state, indicated by reference **122** in which it takes up mini/-nu/n volume, but can be opened out from the flattened condition to elongated form as indicated by reference numeral **124** in FIG. **12**. The elongated form as shown is made up of polygonal, in this case hexagonal, cavities **126** each made up of front side panels **128**, rear side panels **130** and partition or diaphragm panels **132**. The panels **128** to **132** are of equal width but this need not be the case. In the flattened condition as indicated by reference **120**, the panels **128**, **130** and **132** of each cavity are face to face. As can be seen from FIG. **12**, each partition panel **132** is common to each pair of adjacent cavities **126**.

A flexible member in the form of a rope or cable **134** is connected to the center of each of the partition panels **132**, so that the cable units the extent to which the structure erects or more particularly the extent to which each of the cavities can erect so that it will have the hexagonal form shown in FIG. **12**.

Lining the inner sides of the panels **128** and **130** are flexible membranes sheets **136** to **138** which form retention means for retaining the material which is eventually charged into the cavity **126** to fill same for the forming of the eventual shoring or building structure.

If reference is made to FIG. **13** the erected opened structure is shown, and the cavities **126** can simply be filled with the ballast material and/or concrete. If the linings **136** and **138** are omitted, then the ballast material must be of a size as not to pass through the mesh of the panels **128** and **130**.

When the membranes **136** and **138** are provided, any suitable fill material can be used.

The gabion structure according to this aspect of the present invention may take other forms than that de-

scribed, and it can be used in connection with any of the arrangements disclosed herein. In particular, the respective panels **128**, **130** and **132** may be inter-connected by the clip means or other means as described herein. It will be appreciated that such clips may require to pass through the membranes **136** and **138**. The membranes may be constructed of materials as disclosed herein.

Resulting building or shoring structures constructed using the gabion structure as illustrated in FIGS. **12** and **13** may be used singly or in Juxtaposition or superposition or in any other appropriate combination depending upon the requirement of the final structure.

The cage structure illustrated may be of any size. For example each hexagonal cavity may be of the order of 3 meters wide by 3 meters high. Erection is obtained on site quite simply by pulling the structure to the erected condition.

Any feature or any aspect of the invention described herein can be used with any one or more of the features of any one or more of the other aspects of the invention as described herein.

The flexible material used in connection with the invention may include or comprise a layer of metallic foil, provided with apertures to allow liquid to drain therethrough. If the foil is used on its own the apertures therein must be of a size to allow liquid to drain therethrough but must hold back the filling material, which must be selected accordingly.

Also as an outer layer of the flexible material there can be used the matting known as ANKERMAT which comprises coiled plastics filaments which can hold soil to make the block to be surfaced with soil to enable the growing of a grass covering thereover.

I claim:

1. A method of providing an on-site structural block comprising transporting to the site a cage structure in a collapsed flattened condition, said cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising pivotally interconnected panels of open work mesh and lining the interior of said cage with flexible sheet material, and filling the cage at least partially with fluent solid material of a particulate nature, which but for the lining material, would pass through the meshes of the cage and wherein the cage is erectable to the shape of the block to be provided by moving the panels apart, erecting the cage, including applying to the panels before or after erection so as to at least partially line the interior of said cage, said flexible sheet material, said panels comprising side panels defining side walls and partition panels pivotally interconnecting the side walls, said side walls being folded conctertina fashion when the cage is in the collapsed condition, and the cage being erectable into a condition for filling whereby the cage defines a row of side by side cavities for receiving the filling material.

2. A method according to claim **1** wherein the sheet material is applied to the cage panels before erection, arranging the sheet material to unfold with the cage when it is moved to the erected condition.

3. A method according to claim **1** or **2** providing the flexible sheet material in a geo-textile form which is in the nature of a fibrous felt hence allowing the passage therethrough of moisture but retaining the particulate material within the cage structure.

4. A method according to claim **1** or **2** wherein the flexible sheet material is a fibrous mat and impregnating said mat with synthetic resin which cures hard after positioning in the cage.

5. A method according to claim **3** providing a sheet material in a geo-textile form and lining each of said walls with the geo-textile material.

6. A method according to claim **3** wherein the sheet material is in geo-textile form and attaching the material to the cage by means of clips which engage with the cage structure and the material.

7. A method according to claim **1** or **2** providing the cage structure with interconnected side panels and partition panels and erecting the cage by moving the panels apart into a condition for filling with particulate material whereby the cage defines a row of side by side hexagonal cavities for receiving the filling material.

8. A method according to claim **1** or **2** providing a flexible cord which passes through the partition panels and is connected thereto, and erecting the cage by pulling on the cord to move the partition walls apart and to unfold the side wall panels in sequence.

9. A method according to any of claims **1** or **2** by defining said open-work mesh by securing metal rods or wires together at their cross-over points.

10. A method according to claim **9** forming said open-work mesh from sets of spaced parallel metal rods lying at right angles to each other.

11. A method according to claim **1** or **2** wherein the filling material is taken from any of or any mixture of said rubble, aggregate, concrete, soil, stones, shale or the like.

12. A method according to any of claims **1** or **2** wherein the block is used as a wall structure.

13. A method according to claim **12** wherein the top of the wall structure is filled with soil, and is planted with plants in order to provide an enhanced appearance to the structure.

14. A method according to any of claims **1** or **2** wherein the block is used as a shoring structure either by itself or in conjunction with other suitable blocks arranged adjacent thereto or on top thereof.

15. A method according to any of claims **1** or **2** wherein the block is filled with concrete and is used as a building block.

16. A method according to claim **15** wherein reinforcement rods are embedded in the concrete and are supported by the open-work mesh of the cage prior to the filling of the cage with concrete.

17. A method according to any of claims **1** or **2** wherein the outer surface of the cage, at least where it is defined by the open work mesh, is sprayed with a synthetic resinous coating material which bonds to the cage mesh and to the lining material to provide an enhanced surface finish.

18. A method according to any of claims **1** or **2** wherein when the cage is filled with concrete, the lining material is removed by sand blasting after the concrete has set, and the cage at least where defined by said open work mesh is covered by means of a coating of synthetic resinous material which anchors to the concrete and the open-work mesh and provides an enhanced surface finish.

19. A cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising pivotally interconnected panels of open work mesh, means which permit the cage structure to be moveable from a flattened condition to an erected condition by moving the panels apart, and a lining material lying to the inside of said open work

mesh to enable the cage to be filled with a particulate material which would pass through the open work mesh were it not for the presence of the lining material and wherein the cage comprises a plurality of pivotally interconnected side panels defining side walls and transverse partition panels pivotally interconnecting the side walls, and the cage can be moved to a collapsed condition in which the side panels are folded concertina fashion and an erection means is provided and serves as a means for erecting the cage structure to cause the cage to erect to a form defined by a plurality of sub cages arranged in a row.

20. A cage according to claim **19** wherein said lining material is connected to the insides of the panels forming the walls of the cage and folds with the folding of the cage panels between the collapsed and erected condition.

21. A cage structure according to claim **19** wherein a plurality of partially interconnected side panels form the side walls, and the side walls are connected by partition panels which are pivotally connected thereto, and the cage structure can be moved to a collapsed condition wherein the side panels are folded concertina fashion and the erection means is in the form of a flexible cord which is connected to the partition panels and serves as a means for erecting the cage structure by pulling on said cord to cause the cage to erect to a form defined by a plurality of sub-cages arranged in a row.

22. A method of providing an on site structural block comprising transporting to the site a cage structure, in a collapsed, flattened condition, said cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising pivotally interconnected panels of open work mesh, means which permit the cage structure to be moveable from the flattened condition to an erected condition by moving the panels apart, and a lining material lying to the inside of said open work mesh to enable the cage to be filled with a particulate material which would pass through the open work mesh were it not for the presence of the lining material in said flattened condition, which is erectable to the shape of the block to be provided by moving the panels apart, erecting the cage, including applying to the panels before or after erection so as to at least partially line the interior of said cage, said lining material, with said lining material comprising a flexible sheet, and filling the cage at least partially with fluent solid material of a particulate nature which, but for the lining material, would pass through the meshes of the cage, said panels comprising said panels, defining side walls, and partition panels pivotally interconnecting the side walls, said side walls being folded concertina fashion when the cage is in the collapsed condition, and the cage being erectable into a condition for filling whereby the cage defines a row of side by side cavities for receiving the filling material, said lining material lying to the insides of the side walls.

23. A method of providing an on site structural block comprising transporting to the site a cage structure, in a collapsed, flattened condition, said cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising pivotally interconnected panels of open work mesh, means which permit the cage structure to be moveable from the flattened condition to an erected condition by moving the panels apart, and a lining material lying to the inside of said open work mesh to enable the cage to be filled with a particulate material which would pass through the open work mesh were it not for the presence of the lining material in said flattened condition, which is erectable to the shape of the block to be provided by moving the panels apart, erecting the cage, including applying to the panels before or after erection so as to at least partially line the interior of said cage, said lining material, with said lining material comprising a flexible sheet, and filling the cage at least partially with fluent solid material of a particulate nature which, but for the lining material, would pass through the meshes of the cage, said panels comprising side panels, defining side walls, and partition panels pivotally interconnecting the side walls, said side walls being folded concertina fashion when the cage is in the collapsed condition, and the cage being erectable into a condition for filling whereby the cage defines a row of side by side hexagonal cavities for receiving the filling material, said lining material lying to the insides of the side walls.

24. A method according to claim **23**, wherein a flexible cord passes through the partition walls and is connected thereto, and wherein the cage is erected by pulling on the cord to move the partition walls apart and to unfold the side wall panels in sequence.

25. A cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising pivotally interconnected panels of open work mesh, means which permit the cage structure to be moveable from a flattened condition to an erected condition by moving the panels apart, and a lining material lying to the inside of said open work mesh to enable the cage to be filled with a particulate material which would pass through the open work mesh where it not for the presence of the lining material, wherein a plurality of pivotally interconnected side panels form the side walls, and the side walls are connected by partition panels which are pivotally connected thereto, and the cage structure can be moved to a collapsed condition wherein the side panels are folded concertina fashion and wherein said cage structure comprises means for erecting the cage structure to cause the cage to erect to a form defined by a plurality of sub-cages arranged in a row.

26. A cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising pivotally interconnected panels of open work mesh, means which permit the cage structure to be moveable from a flattened condition to an erected condition by moving the panels apart, and a lining material lying to the inside of said open work mesh to enable the cage to be filled with a particulate material which would pass through the open work mesh were it not for the presence of the lining material, wherein a plurality of pivotally interconnected side panels form the side walls, and the side walls are connected by partition panels which are pivotally connected thereto, and the cage structure can be moved to a collapsed condition wherein the side panels are folded concertina fashion and a flexible cord is connected to the partition panels and serves as a means for erecting the cage structure by pulling on said cord to cause the cage to erect to a form defined by a plurality of sub-cages arranged in a row.

* * * * *

US005472297A

United States Patent [19]

Heselden

[11] **Patent Number: 5,472,297**

[45] **Date of Patent: * Dec. 5, 1995**

[54] **BUILDING AND SHORING BLOCKS**

[75] Inventor: **James W. Heselden**, Leeds, England

[73] Assignee: **Hesco Bastion Limited**, Leeds, England

[*] Notice: The portion of the term of this patent subsequent to Aug. 2, 2011, has been disclaimed.

[21] Appl. No.: **226,568**

[22] Filed: **Apr. 12, 1994**

Related U.S. Application Data

[63] Continuation of Ser. No. 776,268, filed as PCT/GB90/00485, Apr. 2, 1990, Pat. No. 5,333,970.

[30] **Foreign Application Priority Data**

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Jul. 10, 1989	[GB]	United Kingdom	8922639
Oct. 24, 1989	[GB]	United Kingdom	8923934
Jan. 20, 1990	[GB]	United Kingdom	9001376

[51] **Int. Cl.**[6] **E02D 29/02**

[52] **U.S. Cl.** **405/286**; 405/32; 405/258

[58] **Field of Search** 405/15, 16, 19, 405/21, 30, 32, 258, 284, 286, 287, 287.1

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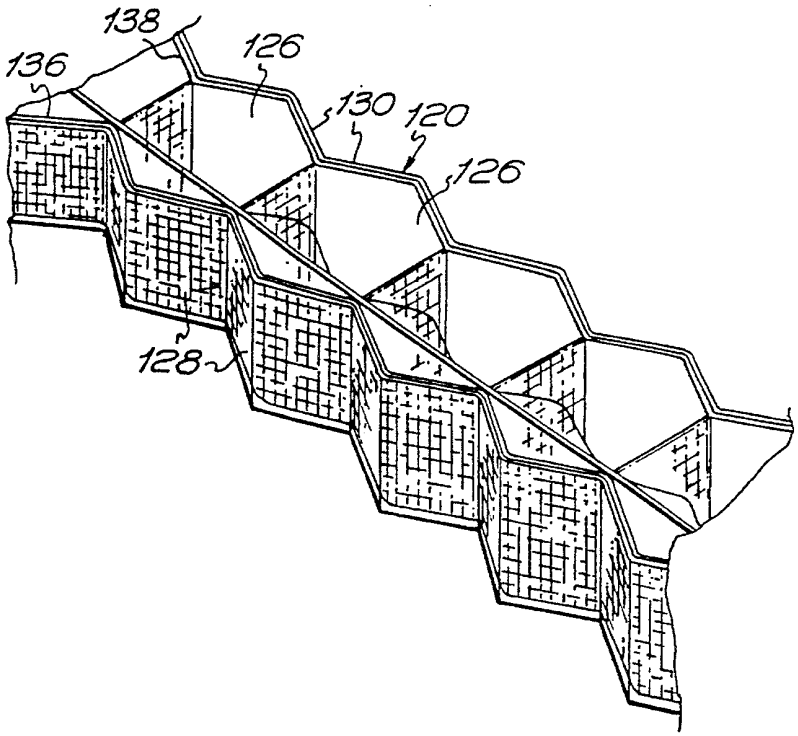
Primary Examiner—David H. Corbin
Attorney, Agent, or Firm—Klauber & Jackson

[57] **ABSTRACT**

The invention provides that wire mesh cage structures (**22**) are used to provide structural blocks usable in building, shoring walls and the like. The cage is lined with a geotextile fibrous material (**24**) which allows the passage therethrough of water, but not particulate material (**26**) such as cement, sand aggregate which are used as materials for filling the cage. The invention discloses novel forms of cage structure and also that the finished blocks can be coated with curable synthetic resin to conceal the mesh and provide a decorative finish.

11 Claims, 5 Drawing Sheets



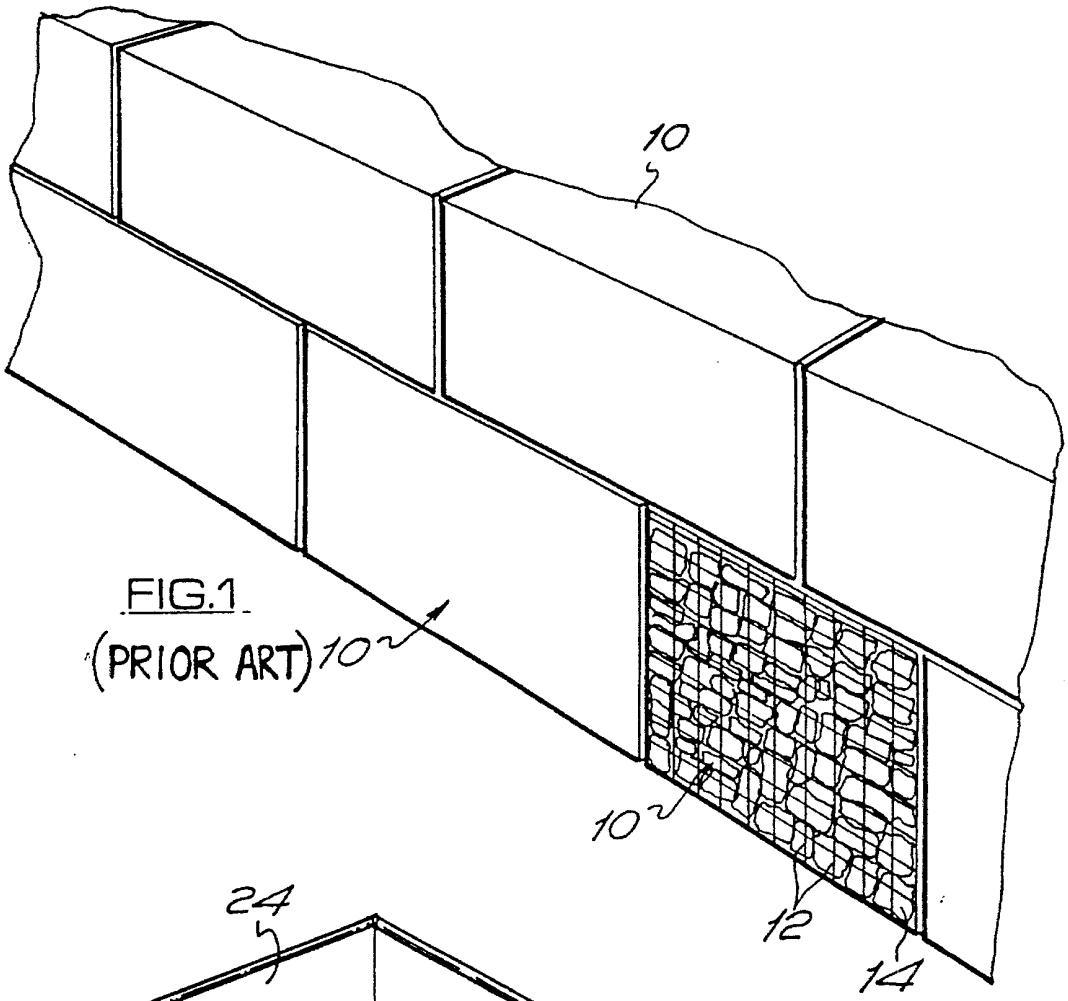


FIG.1
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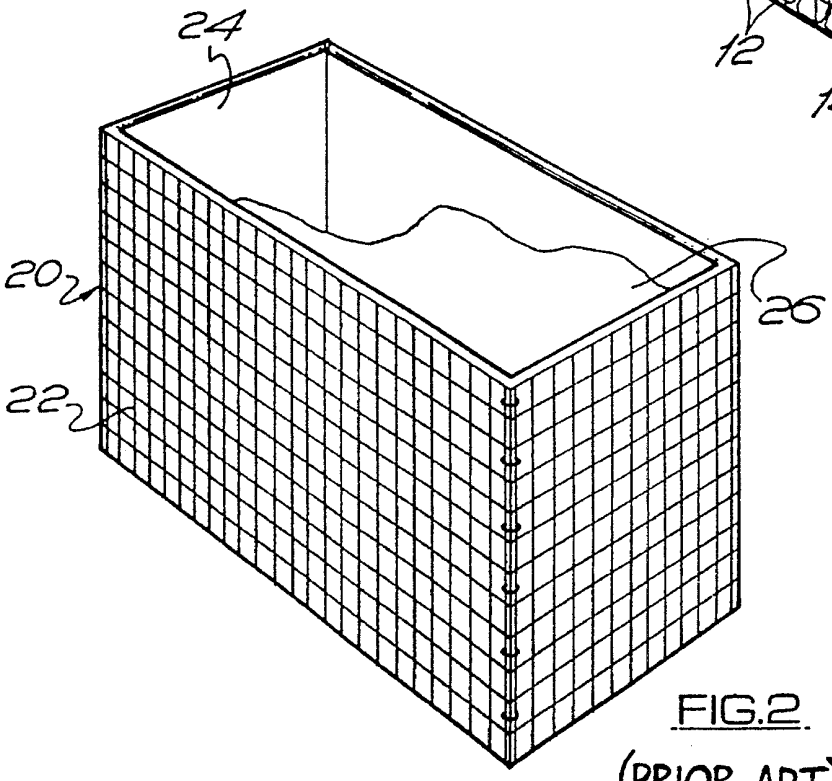

FIG.2
(PRIOR ART)

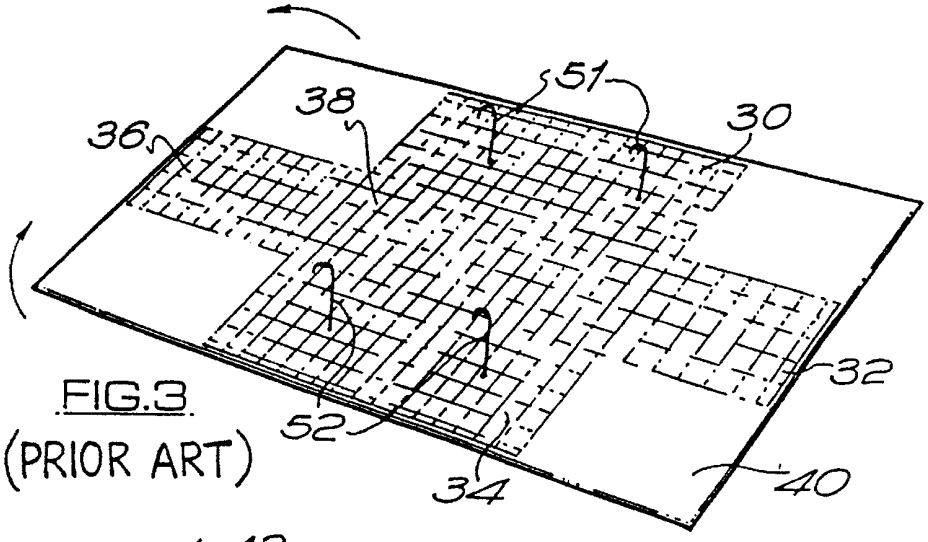

FIG.3
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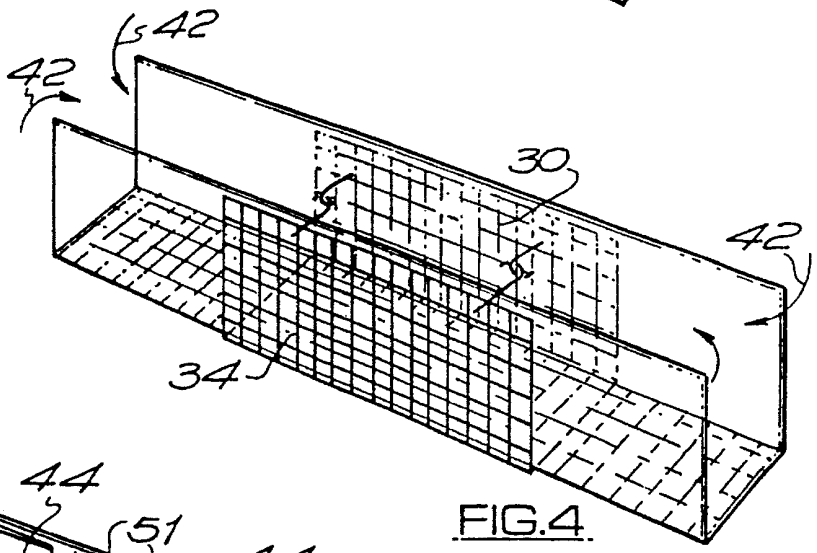

FIG.4
(PRIOR ART)

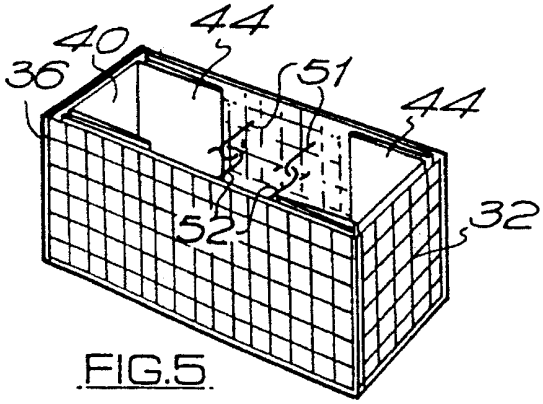

FIG.5
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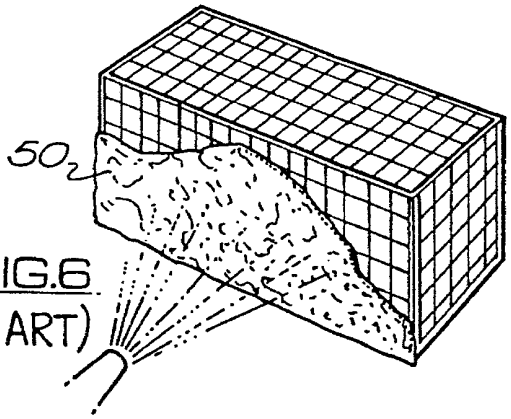

FIG.6
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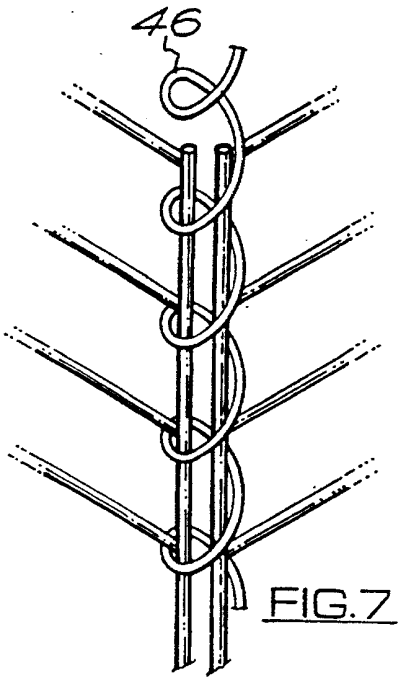


FIG.7

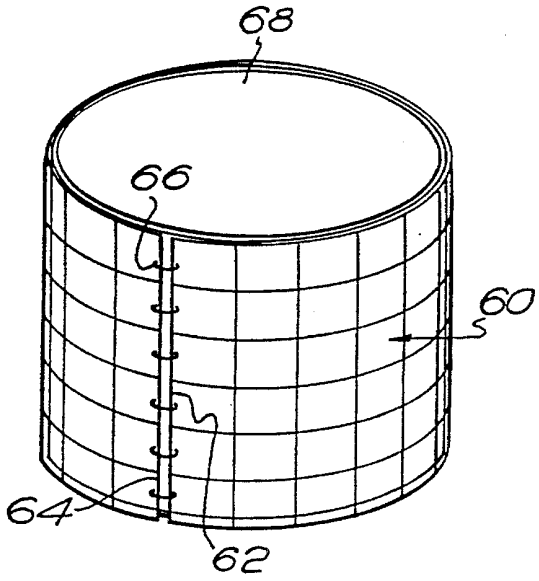


FIG.8

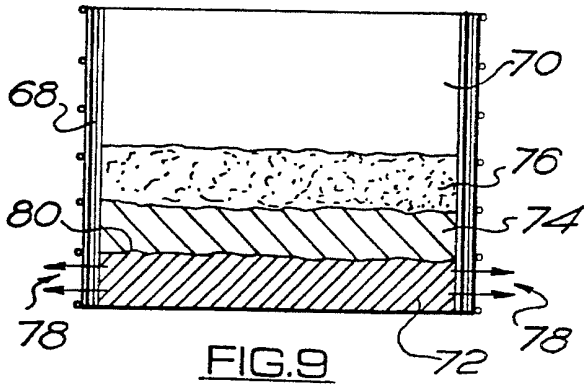
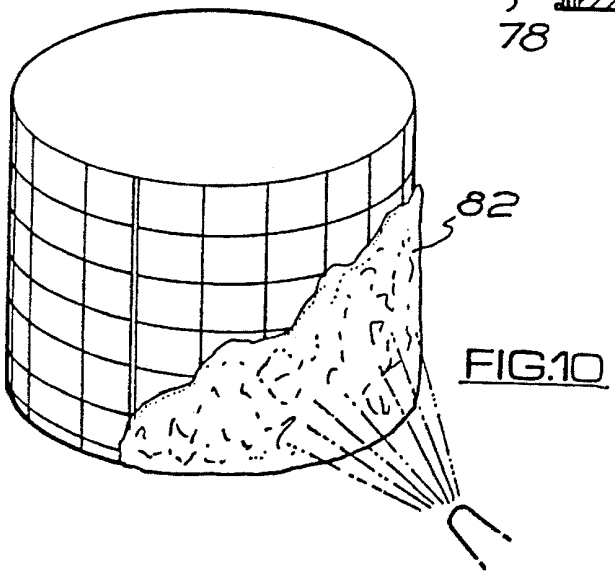


FIG.9



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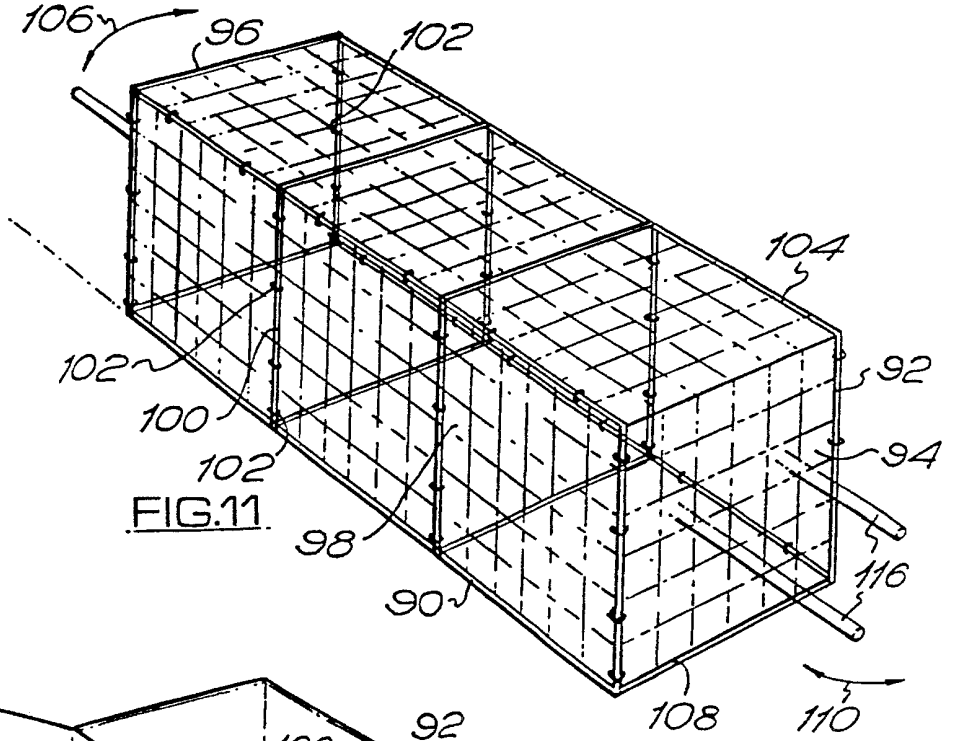

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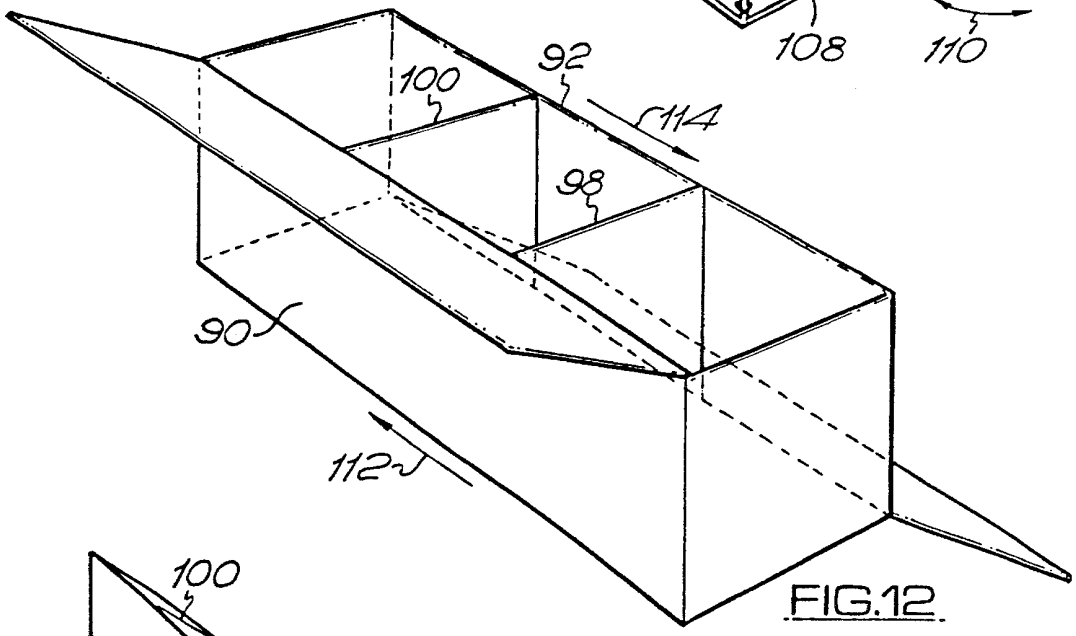

FIG.12

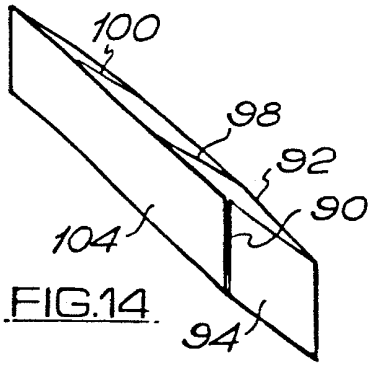

FIG.14

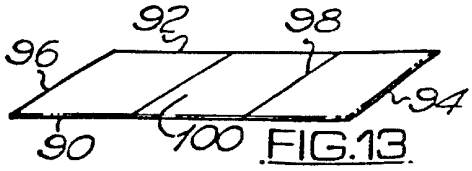

FIG.13

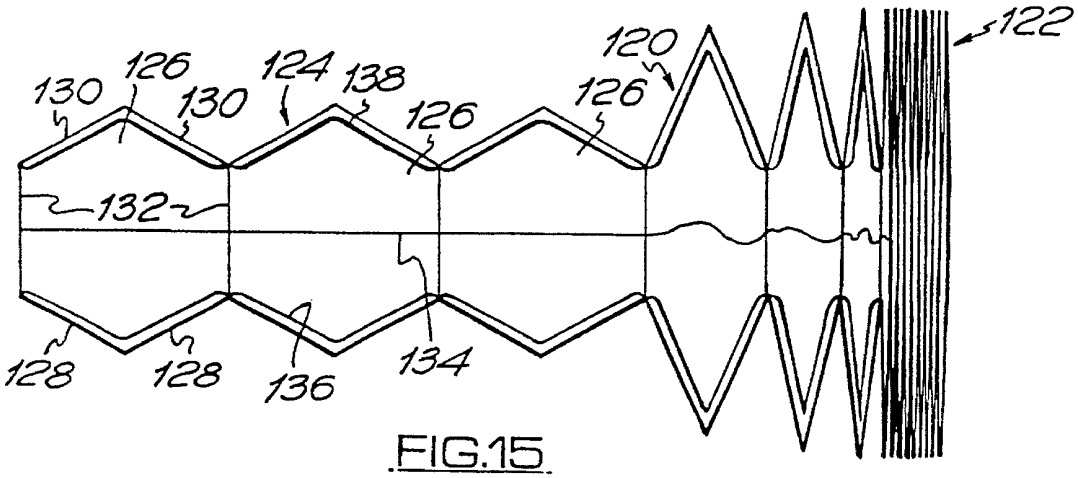
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FIG.15

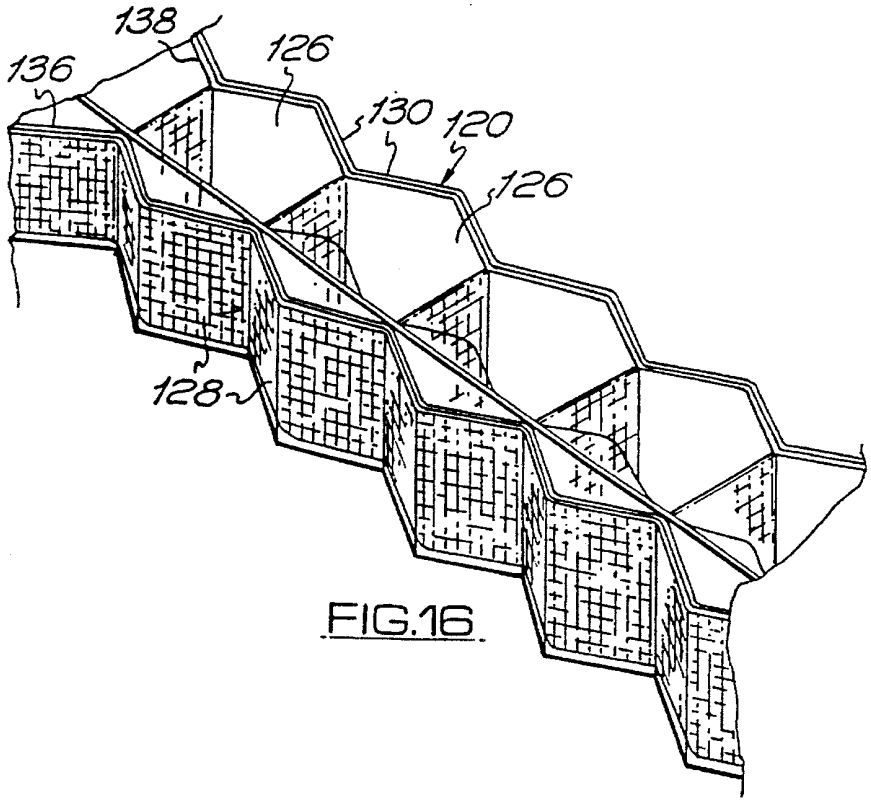
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FIG.16

BUILDING AND SHORING BLOCKS

This is a Continuation of application Ser. No. 07/776,268, filed as PCT/GB90/00485, Apr. 2, 1990, now U.S. Pat. No. 5,333,970.

This invention relates to building and shoring structures in the form of blocks, and in particular concerns building and shoring blocks which comprise a metallic mesh cage which is filled with ballast material.

Certain of each structures are known by the name "gabions" and comprise essentially wire mesh cages defining a block shape, which are filled with rock, stone and rubble and the like. The stone is generally placed immediately inside the cage surface so as to be visible through the cage, and in this connection the stone typically is dressed and laid in the nature of a wall so as to have an enhanced appearance, as frequently the stone surfaces are left exposed to view. This may apply for example when the gabions are used, as they are extensively, for the shoring up of an embankment for example adjacent a motorway or for forming a sea defence or the like.

Although these gabions are made up of wire mesh cages filled with stone and other rubble, in effect they become solid blocks which can be used for building, shorings for hillsides, sea walls and the like, for walls and for other purposes.

However, the method of filling the wire mesh cages in using facing stone is expensive, and furthermore considerable time and effort is required in filling the gabion cages. Obviously the stone and other rubble is required in accordance with the conventional method of construction, because otherwise the material would simply pass through the meshes of the wire mesh cage.

In the instant invention however, structural blocks, which can be used as gabions and for other purposes are provided whereby a much looser particulate, fluent material such as sand, concrete, ash and soil colliery waste and small particular aggregate can be used as the ballast material either singly or in combination with other material without the disadvantage of the known gabion structures arising, and in accordance with the invention in a first aspect there is provided a method of providing an on site structural block comprising providing at the site a cage conforming to the shape of the block to be provided, said cage comprising at least partially open work mesh, and at least partially lining the interior of said cage with flexible sheet material, and filling the cage at least partially with fluent solid material of a particulate nature which, but for the lining material, would pass through the meshes of the cage. The fluent solid material can in fact be any of a wide range of materials. Thus it may be mixed with water and pumped into the cage which may or may not as required allow the water to escape leaving a solid mass of small particles as the infill. Again, synthetic resin systems which may be foamable or not can be used, such systems being of a nature which are liquid when poured into the cage and solidify and fill the cage interior to form the ballast.

The flexible lining material may comprise a flexible fabric, mat or a plastic film, or metallic foil or a laminate or a combination of materials, but in any event it simply forms a barrier layer whereby the ballast will be retained inside the gabion mesh even if the ballast material is something which is as loose and as small in particulate size, as builders sand. The barrier layer may be a pre-impregnated fibrous mat or felt or the like which cures hard after positioning in the cage.

By this arrangement, when the invention is used for gabion cages, the flexibility of use of gabion structures is considerably increased, because the range of ballast materials which can be used is substantially increased. It is usual for example for quantities of sand or other particulate material to be more readily available than dressed stone.

To further enhance a gabion structure according to the invention, it may after it has been placed in operative position be oversprayed or coated by means of a curable synthetic composition, for example a polyester or epoxy resin composition to fully cover the wire mesh to prevent corrosion from hostile atmospheres and which resin composition may or may not be provided with glass fibre reinforcement and/or colouring for enhancing the overall effect. Such resin material when cured can be arranged to anchor aggresively to the wire mesh cage structure and also the barrier layer, especially when the barrier layer is a pre-preg, thereby in fact somewhat concealing the gabion from view and creating a pleasant appearance. The application of the synthetic resin may be by spray or the like, and the resin can be applied in any appropriate quantity. The barrier layer may be absorbent in nature so as to soak up at least some of the resin.

It is technically possible to prepare the gabion cages under factory conditions, and to fill and coat the cages in the factory and then transport same to site, but it is preferred that the gabions be filled on site and subsequently coated when placed in position.

The invention also applies to the formation of concrete structures such as footings, ring beams, columns, bases, and generally any structure or formation including concrete or concrete like material, with or without steel reinforcement, and in using the present invention in this regard the utilisation of conventional concrete shuttering can be eliminated.

When casting a concrete structure, it is necessary to provide shuttering, which may be in the form of boards or plates shaped to form a cavity to be filled with the concrete in order to form the eventual structure. The provision of such shuttering is time consuming and costly, and if timber shuttering, which is the most popular type, is used, then invariably skilled joinery craftsmen are required to erect the shuttering prior to the pouring of the concrete.

Concrete footings are used extensively in the erection of buildings, especially tall buildings, such as office blocks, and such footings have to be set into the ground, usually under ground level to take the anticipated massive building loads.

When the ground is excavated for the provision of such footings, the erection of shuttering at under ground level is complicated.

In accordance with a preferred feature of the present invention therefore, a concrete structure is produced by filling the cage at least partially with concrete to form the concrete structure, and the flexible sheet material is water porous having the characteristic which allows water to pass thereto but prevents the concrete from exuding through the mesh when poured into the cavity.

By this means and method, concrete structures can be formed rapidly and readily. The cage forms the support for the concrete as it is poured into the cavity, whilst the said flexible sheet material forms a means for allowing the water quickly to percolate from the poured concrete and to enhance the setting speed of the concrete.

When compared with the conventional shuttering method several highly significant advantages result.

Firstly, when concrete is poured into a cavity defined by conventional shuttering, moisture in the concrete can escape from the mix only through the surface of the body of concrete and, therefore, the curing rate is slow. With the instant invention, however, the water immediately starts to percolate through the lining material so that curing com-

mences immediately, and final curing takes place at a faster rate. Secondly, the cage can, especially where the concrete structure is a footing which will be underground and will be covered in the final building in which it is embodied, can remain with the cast concrete, and it is not necessary to erect and remove shuttering as in the conventional shuttering method. Thirdly, the cage can be pre-formed under factory conditions, and it is not necessary to erect shuttering on site; therefore, it is not necessary to have skilled joiners on site, who may in inclement weather in any event be unable to work, which can delay the completion of the project.

It is preferred that where the cage forms a side wall to support the poured concrete, that there should be reinforcing restraining means which may be in the form of a partition restraining the cage walls from bowing or bulging outwardly under the gravitational effect of the poured concrete. It may be possible to mitigate the need for this restraining means if the concrete is poured into the cavity sequentially and at intervals so that a first layer of concrete is poured into the bottom of the cavity and after a predetermined time when the concrete has been given an opportunity at least partially to set a second layer of similar thickness is deposited in the cavity, and this procedure is repeated until such times as the cavity has been filled to the required extent. By this arangement, the partial rigidity of the previously poured layer of concrete assists in maintaining the side wall or walls of the cage means in the correct configuration.

The poured concrete may be vibrated for the homogenisation and levelling of same in accordance with conventional practice.

The utilisation of the cage and flexible sheet material to form the support for the poured concrete means that, as indicated above, the cage can be pre-fabricated to any desired shape, and for certain shapes the cage may be of a type which is collapsible to a flat condition making it suitable for transportation to the site, and so that it can be easily erected and filled on site by relatively unskilled personnel.

If the cage is provided with internal partitions, these partitions can be used, if they are of mesh construction, for suspending steel reinforcement bars in predetermined position, and therefore the partitions can serve two purposes one of which is to keep the cage walls in desired position and the other of which is to support reinforcement rods.

The utilisation of a cage may also permit a removal of the restrictions on the shape of the cavity which can be constructed using conventional shuttering. Thus, if building footings for supporting the main columns traditionally are of square box configuration because square box configuration is the easiest configuration to be constructed using conventional shuttering, it may be possible to replace such a square footing with a cylindrical footing by simply forming a length of the open work mesh as used in the present invention into circular configuratiion with the inner surface of the cage being lined with the said water porous material.

The said material is preferably the known geo-textile material sold by Dupont and I.C.I., and which is designed to allow water to pass through the material, but to prevent solid particles which are in a pasty condition from exuding through the material, even although pressed strongly thereagainst.

The present invention also applies in another aspect to a cage structure for use in providing structural blocks, and in accordance with this aspect of the present invention there is provided a cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising a wall or walls at least partially defined by open work mesh, and a lining material lying to the inside of said open work mesh to enable the cage to be filled with a particulate material which would pass through the open work mesh were it not for the presence of the lining material.

Preferably, the cage is made up of a plurality of hingedly interconnected panels of said open work mesh enabling the cage to be collapsed between flattened and erected conditions, and wherein said lining material is connected to the insides of the panels forming the walls of the cage and folds with the folding of the cage panels between the collapsed and erected conditions.

Also, it is preferred that the cage when erected is of rectangular configuration defining side walls, end walls and a base, the base being pivotally connected at one side to the lower edge of one of the side walls, and the side and end walls being hingedly interconnected at the corners of the rectangular configuration.

There may be intermediate partition walls extending between said side walls.

According to a further preferred feature, the cage comprises hingedly interconnected side panels defining said walls and transverse partition panels interconnecting the side walls, said cage being movable between a collapsed condition in which the side panels are folded concertina fashion and an erected condition in which the side panels and partition panels form a row of cavities, said lining material lying to the inside of said side panels.

The lining material is preferably a geo-textile felt material.

The cage structures according to yet a further aspect of the invention can be utilized for conventional gabion structures and in accordance with this aspect there is provided a cage structure for use in providing a structural block comprising pivotally interconnected open work mesh panels which provide cage walls and are pivotally interconnected so as to be movable between a collapsed condition and an erected condition, in which latter condition the cage structure defines one or more cavities to be filled with building materials.

Such a cage is simply erected at the site by relative pivoting of the panels, and then the erected structure is filled adjacent the panels at least with the filling material being stones, rocks, boulders or the like which are individually larger in dimension than the dimensions of the apertures in the open work mesh.

It is known to provide gabion cages in the form of flat blanks made up of portions which are pivotally interconnected so that the cage can be erected on site, but such known cage structures comprise a base panel with side panels hinged to the edges thereof. On site, the side panels are hinged to vertical positions, and the meeting vertical edges of adjacent sides are connected by suitable clips which are applied by means of an applicatioin gun, thereby to create the gabion box structure which has an open top. The thus constructed gabion cage is then filled with the filling material.

One shortcoming of such a cage is that the clips must be applied by a power gun on site, which is undesirable, because it requires the provision of power on the site which has its own inherent problems, and secondly, when such a gabion cage is loaded i.e. filled with filling material, there is an outward pressure on the sides which concentrates on the said clips, and if the clips are not therefore properly and securely applied, then failure of the clips can and does take place.

Preferably, the cage structure defines two side walls and two end walls which are pivotally interconnected at the

corners, and a base panel pivotally connected to a lower edge or one of the side panels.

With the preferred gabion cage structure in accordance with the present invention, the sides of the gabion cage are hingedly interconnected under factory conditions, and a base is hinged to one only of the sides so that for transportation, the cage can be collapsed by relative pivoting of the sides, parallelogram fashion, and the base can be folded over onto the flattened sides, in fact as described in the said co-pending application.

If the cage has internal partitions, these can also be pivotally connected to opposite sides when the cage is constructed under factory conditions. By constructing the cage under factory conditions, it is easier to ensure that the applied clips will be effectively applied so as properly to perform the function of holding the gabion cage sides together.

On site, the cage is simply erected by unfolding the base and moving the sides to the erected condition. The remaining sides of the base may be clipped to the other sides of the gabion cage structure if necessary, but as will be understood from the nature of filling of the cage, the joint between the base edges and the sides is not required to be as high in strength as the joints between the adjacent sides and partition panels.

The cabion cage may also be provided with a top panel, of similar size to the base, but hinged when factory constructed to the side opposite the side to which the base is hinged.

In another embodiment of such a cage, in the cage structures a plurality of pivotally interconnected side panels form the side walls, and the side walls are connected by partition panels which are pivotally connected thereto, and the cage structure can be moved to a collapsed condition wherein the side panels are folded concertina fashion and a flexible cord is connected to the partition panels and serves as a means for erecting the cage structure by pulling on said cord to cause the cage to erect to a form defined by a plurality of sub-cages arranged in a row.

Gabion cages constructed in accordance with this aspect of the invention do not require the utilisation on site of power tools for the application of connecting clips as the applied clips which connect the base and sides and top of sides if a top is provided can be of a type which is applied by hand.

Another advantage of the cage according to this aspect of the present invention is that it can be provided under factory conditions with partition panels. The conventional erectible gabion cage requires to have the partition panels connected on site.

In accordance with yet a further aspect of the present invention, a cage structure can be fabricated under controlled conditions e.g. factory conditions, so that it has a flattened or compressed minimum volume form, and then can be moved to erected condition on site and filled on site to form a shoring or building structure or the like, the gabion cage structure being characterised in that in the flattened or compressed form its side walls are concertina folded.

The cage structure may be used in conjunction with a flexible member such as a rope or cable connected to respective panels of the structure to limit the extent to which it can be opened, so that for example the resulting opened out cage structure will have a particular form.

In one embodiment of this aspect of the invention, in the opened out form the cage structure is elongated and is made up of polygonal cavities arranged in a row, with one panel being common and defining a side of each cavity of adjacent polygonal cavities. The cavities preferably are hexagonal in shape and the common panels are partition or diaphragm panels, whilst the remaining panels, four to each cavity, define the sides of the elongated structure.

The said flexible member when provided preferably is anchored to the partition panels to limit the extent to which they can be moved apart as the collapsed structure is moved from the flattened or compressed condition to the fully opened condition.

The cage structure preferably is associated with lining membrane means, and preferably such means comprises lining material lying to the inner sides of the side panels. The membrane means preferably comprise two elongated strips of the lining material which lie to the inner sides of the side panels and extend for the length of the structure. In this connection the partition panels have to be coupled to the side panels by a means which passes through the lining strips.

The panels are preferably of open work wire mesh.

Such fastening means may as disclosed above application comprise clips or the like.

The blocks according to the invention can be used for earth shoring purposes and when sprayed with the resin composition will provide attractive wall surfaces. Alternatively, the blocks can be used for providing barracades, temporary accommodations, army compounds, shelters for defence against attack, sea defences and any of a large number of building structures which can be created using building blocks.

The flexible barrier layer when used to separate the filling material from the cage structure may be any suitable, but we have found that the bonded fabric felt materials of the geotextile nature have been particularly suitable.

Embodiments of the invention, and the advantageous features thereof, will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. **1** shows in perspective elevation a shoring wall formed from gabions of conventional construction;

FIG. **2** shows a gabion according to the concept of the present invention;

FIGS. **3**, **4** and **5** show a method of constructing a gabion according to the invention using a preformed blank;

FIG. **6** shows how a gabion according to the invention may be coated to provide a decorative, protective finish;

FIG. **7** illustrates a spiral clip usable for interconnecting panels of the gabion cage shown in FIG. **2**;

FIG. **8** is a perspective view of a cage means according to another embodiment of the present invention;

FIG. **9** shows the cage means of FIG. **8** in sectional elevation when partially filled with concrete;

FIG. **10** shows a concrete structure created using the cage means of FIG. **8**;

FIG. **11** shows a cage means useful in preparing the concrete structure in bar or block form;

FIG. **12** shows the cage structure of FIG. **11** in an alternative position;

FIGS. **13** and **14** show how the cage means of FIG. **11** may be folded to a collapsed condition.

FIG. **15** is a plan view of a gabion cage structure according to another embodiment of the invention which is being moved from the flattened compressed condition to the erected condition; and

FIG. **16** is a perspective view of the cage structure of FIG. **1** in the erected condition.

Referring to FIG. **1**, conventional gabions **10** are in the form of massive blocks defined by metal wire mesh cages **12** in which are contained stones **14** and other rubble. The filling material for the cages at the wire mesh panels is of a

size such that it will not pass through the meshes of the cage. The wires of the cage may be uncoated or coated with protective plastics material.

The use of gabions for wall structures, shoring walls, barracades, coastal supports is well known. The use of gabions effectively combats erosion and they are particularly suitable for stabilising and strengthening embankments. The gabion cages are filled on site by relatively unskilled labour but they still require the use of fairly large dimension filling stones. Gabions have the advantage that they do have some flexibility to allow some movement and change in shape should local ground subsidence occur. Their strength and integrity are retained. The gabions furthermore are porous and it is not therefore normally necessary to incorporate drainage systems.

FIG. **2** shows a gabion according to the present invention, and it will be seen that the gabion **20** comprises a gabion cage **22** of steel rods or wires as in the conventional gabion **10**, but in addition the steel cage is lined by flexible lining material **24** which enables the gabion to be filled entirely with a ballast material of a considerably smaller particle size. For example sand can be used as the ballast material. This enhances the utility of the gabion structure. The gabion shown in FIG. **2** is illustrated as being partially filled with sand or like loose material **26**. In practise when the gabion is filled, it will be closed by means of a wire mesh lid, and similarly a layer of the flexible material **24** may be placed over the filling. The flexible sheet material which is used as the covering may be any suitable, but we have found that bonded felts of synthetic fibres which are of considerable tensile strength, but are porous so as to allow liquid to pass therethrough, but not the particular ballast material, are particularly suitable.

According to a further feature of the present invention, when the gabion **20** has been filled and lidded, and is in position in a wall or shoring structure, the exposed faces are then sprayed with a curable synthetic resin composition **50** as shown in FIG. **6** in order to form a relatively even and textured surface over the metal cage, to give the appearance for example of a rough cast wall. The resin which is used subsequently cures and forms an aggresive bond with the sheet material **24** and the metal cage **22**. The sheet material is absorbent and soaks up the resin so forming a good bond.

In the known gabion structures, the metal cage is laid out as a blank and is folded to erected condition, the adjacent edges of the panels being clipped together with stainless steel clips or galvanised spring steel ring clips or helical binders. In the aspect of the invention illustrated in FIGS. **3**, **4** and **5**, the wire mesh panels **30**, **32**, **34**, **36** and **38** making up the cage blank are suitably secured together so as to be relatively hingeable, and the blank is covered by means of a sheet **40** of the said flexible material, which is secured to the said panels. To erect the cage and the sheet material **40**, initially panels **34** and **30** are folded to the position shown in FIG. **4**, following which the excess portions of the material **40** at the comers are tucked inwardly as indicated by arrows **42**, and then the end panels **32** and **36** are turned upwardly until the position shown in FIG. **5** is reached, the said extra portions of the material **40** forming flat fillets **44**. The cage is now ready for filling with the filling material which may be loose particulate material such as sand. FIG. **7** shows how a helical spring binder clip **46** may be used for connecting the ends of the respective panels, but any suitable connecting device can be used.

The gabion shown in FIG. **5** after filling with the ballast material may be closed by means of a wire mesh lid panel as in the conventional arrangement.

It is to be noted from FIGS. **3**, **4** and **5**, that connected to the panels **30** and **34** are tie hooks **51** and **52**. These hooks link with each other as shown in FIG. **4** when the panels **30** and **34** are erected, in order to keep the panels connected whilst the material **40** is tucked at the corner and then the panels **32** and **36** are folded to the upright position. The use of the ties to hold the panels **30** to **36** together at the corners effects completion of the structure ready for filling.

Again as with the gabion shown in FIG. **2**, the exterior of the gabion or that portion which is visible can be sprayed with a curable synthetic resin in order to form a decorative finish, and in addition to protect the sheet material **24** in the case of FIG. **2**, and **40** in the case of FIG. **5**.

Where the gabions are coated, it may be desirable to ensure that the gabions remain permeable to water to ensure that water can drain through the gabions as happens with the conventional gabions.

The sheet material serves to permit the use of much finer particles as ballast material. Also soil and ash can be used as ballast material, and these materials by and large tend to be much more readily available than the conventional materials such as brick, broken concrete, granite, limestone, sandstone, shingle and slag and stone as used in the conventional gabions.

The gabions may be filled on site by any suitable means such as hand shovels, augers, pumps, earth movers of various types, making filling much quicker than the method used for conventional gabions.

The gabions according to this embodiment of the invention have a number of advantages including the following:

Wet sand or pebbles pumped by a suitable pump can be used as the gabion infill material especially when the site is a beach area.

The gabions according to the invention can be finished cosmetically by the use of the coatings.

The coatings can be selected to be resistant to chemical, salt water, mineral, wind, rain and sand attack.

The gabions according to this embodiment of the invention can compete effectively with equivalent concrete structures.

Reference is now made to FIGS. **8** to **14** which illustrate the application of the invention to the production of concrete structures.

In FIG. **8**, a cage means comprises a strip of steel wire or rod mesh turned into a cylindrical configuration as will be clear from FIG. **8**. The mesh **60** has its free ends **62**, **64**, connected by ring clips **66** which may be applied on site.

Inside the cylindrical mesh cage is a lining material **68**, which is supported by the cage and comprises a felt material which is porous to water but yet prevents the solid material of the concrete from passing therethrough.

To form a concrete structure using the cage means shown in FIG. **8**, it is simply a matter of filling the interior of the cage with concrete as shown in FIG. **9**. As shown in that Figure, the concrete is charged into the cavity **70** in layers **72**, **74**, **76**, and so on until if required the cage is filled. When each layer of concrete is poured into the interior, it is allowed to stand for a predetermined period of time so that the concrete will initially set. As soon as the concrete is charged into the interior of the cage the water percolates through the material **68** and through the mesh, as indicated by arrows **78**, so that in effect drying of the concrete takes place much quicker than it would do in conventional shuttering as the water can escape from the concrete using a conventional shuttering method only from the top surface **80**. With this method, therefore, the concrete cures quicker and the subsequent layers **74** and **76** can be applied so that

the cavity is filled quicker than with conventional shuttering. In addition, for the conventional shuttering of cylindrical concrete structures, special curved fibreglass moulds must be used, and retainers and reinforcing have to be fitted inside the moulds. The erection of moulds on site is time consuming and requires skilled personnel. The provision of a simple cylindrical cage with the material liner **68** provides a much simpler method of shuttering the concrete.

The cage **60** can of course be any suitable length for example to provide cylindrical columns of concrete, and wire mesh partition discs may be arranged inside the cylindrical mesh cage **60** in order to provide reinforcement if required, and in order to provide a means for supporting reinforcing steel bars in the manner as will be described in relation to FIG. **11**.

The cylindrical mesh **60** can be cropped to length before or after filling same with concrete.

When the concrete has cured, the mesh **60** can remain connected to the concrete or it can be removed if required, and to some extent this will depend upon whether or not the exterior of the concrete structure in the final building or other location in which it is used is visible. If it is not visible there is no need to effect any additional treatment to the exterior of the concrete structure, but if it is visible, it can be treated by shot-blasting in order to remove the material **68**, followed by a spraying of the structure by the thermo-setting resin composition **82** as shown in FIG. **10**, as such thermo-setting resin composition will form a better bond to the concrete than it will do to the material **68**.

In the embodiment shown in FIGS. **8** to **10**, the material **68** lines only the inner cylindrical portion of the cage **60**, but it could line the base if required. Also the cage **60** could be provided with a circular lid of mesh material which is placed in position after the topmost layer of concrete is inserted into the cavity.

The mesh cage in conjunction with the material **68** provides an effective shuttering means for concrete which is much simpler to handle and construct and is easier to form into the more difficult shapes such as cylindrical shapes.

It is to be mentioned that this aspect of the invention is not to be considered as being limited to any particular configuration of cage, as the cage configuration will depend upon the eventual shape of the concrete structure required. FIG. **11** shows a form of cage which is suitable for providing concrete structures in the form of blocks or beams. The cage is provided with sides **90** and **92**, ends **94** and **96**, cage partition panels **98** and **100**, each of these components being of a wire mesh construction. The respective parts are hinged together by means of clip hinge rings **102** which enable respective portions to be relatively hinged so that the interconnected portions can be relatively hinged to a flattened condition, as shown in FIG. **14**. Thus, the top **104** can be hinged as indicated by arrow **106** relative to the side **90**, as the base **108** can be hinged as indicated by arrow **110** relative to the side **92**. The sides **90** and **92** can be displaced relative to each other as indicated by arrows **112** and **114** in FIG. **12**, so that the sides **90**, **92**, the end panels **94** and **96** and the partition panels **98** and **100** move to a flattened condition as indicated by FIG. **13**. When these panels and walls are so moved to the flattened condition the top **104** and bottom **108** can be swung onto the outsides of sides **90** and **92** to provide the-flattened assembly.

Such a cage can obviously be readily manufactured under factory conditions and transported to site where it is filled with concrete. It should be mentioned that the inner surfaces of the sides **90** and **92** and the inner surfaces of the ends **94** and **96** will be lined with the material **68** in order to contain the concrete. If appropriate, the base and/or top inner surface may also be lined with this material.

A concrete block or beam can be formed simply by filling the cage shown in FIG. **11**, when of course the top **90** will be open and this top will be closed when the cage has been filled with concrete. The inside of the top **90** can also be lined with material **68** if required, but it is felt that this will be unlikely.

The same benefits are achieved concerning the curing of the concrete as are achieved with the FIGS. **8** to **10** embodiment, and FIG. **11** also shows how reinforcement steel bars **116** will be supported on the ends **94** and **96** and also on the partitions **98**, **100** simply by being passed through the mesh apertures in these components and no additional location means is required for the reinforcing bars. As many reinforcing bars as required may be utilised in connection with the cage.

Again as with the FIGS. **8** to **10** embodiment, the material **68** may be sand-blasted so as to remove same and the resulting concrete structure may be covered by means of the thermo-setting resin **82**.

The concrete structures constructed in accordance with this embodiment of the invention may be used in any suitable application, such as foundations, ring beams, bases, columns, steps, retaining walls and in any application where shuttering is normally required.

Concrete blocks housed in cages maybe used for breakwaters, or sea walls, as described herein.

The clip rings **102** may be simple coiled lengths of steel which can readily be applied to the cage bars by hand.

The invention also provides a collapsible cage structure for use in connection with the method.

In another embodiment of the invention, a wall is created on a base surface by the placement of spaced mesh strip spaced by the required thickness of the wall. Spaced mesh strips may be interconnected by cross-partitions for reinforcement, and concrete is simply poured into the cavity between the spaced strips after the lining of same with the containment material. Such method may be suitable for creating retaining walls of circular configuration and which encircle tanks containing corrosive and dangerous chemicals, so that such retaining walls will form a well around the tank in order to contain the dangerous chemical in the event that there is leakage of same.

Another advantage of this aspect of the invention is that relatively wet concrete can be used in the process of producing the concrete structures because of the rapid expression of the water from the concrete when the concrete is poured into the cage. Because the concrete is relatively wet, air bubbles therein can escape readily giving more homogeneously cured concrete. This compares significantly with the prior art when shuttering is used for forming concrete structures, because in such case there is usually a requirement for the concrete to be delivered in a relatively dry condition e.g. 75 slump. It is more desireable to have the concrete relatively wet, but the disadvantage of this is that relatively wet concrete is more difficult to work with in a shuttering method. No such difficulty arises in accordance with the method of this aspect of the present invention.

Reference is now made to FIGS. **15** and **16** which show a particularly suitable form of cage according to another aspect of the present invention.

Referring to FIGS. **15** and **16**, a cage structure **120** as shown in FIG. **15** is adapted to have a flattened state, indicated by reference **122** in which it takes up minimum volume, but can be opened out from the flattened condition to elongated form as indicated by reference numeral **124** in

FIG. **15**. The elongated form as shown is made up of polygonal, in this case hexagonal, cavities **126** each made up of front side panels **128**, rear side panels **130** and partition or diaphragm panels **132**. The panels **128** to **132** are of equal width but this need not be the case. In the flattened condition as indicated by reference **120**, the panels **128**, **130** and **132** of each cavity are face to face. As can be seen from FIG. **15**, each partition panel **132** is common to each pair of adjacent cavities **126**.

A flexible member in the form of a rope or cable **134** is connected to the centre of each of the partition panels **132**, so that the cable limits the extent to which the structure erects or more particularly the extent to which each of the cavities can erect so that it will have the hexagonal form shown in FIG. **15**.

Lining the inner sides of the panels **128** and **130** are flexible membrane sheets **136** to **138** which form retention means for retaining the material which is eventually charged into the cavity **126** to fill same for the forming of the eventual shoring or building structure.

If reference is made to FIG. **16** the erected opened structure is shown, and the cavities **126** can simply be filled with the ballast material and/or concrete. If the linings **136** and **138** are omitted, then the ballast material must be of a size as not to pass through the mesh of the panels **128** and **130**.

When the membranes **136** and **138** are provided, any suitable fill material can be used.

The gabion structure according to this aspect of the present invention may take other forms than that described, and it can be used in connection with any of the embodiments of the inventions disclosed herein. In particular, the respective panels **128**, **130** and **132** may be inter-connected by the clip means or other means as described herein. It will be appreciated that such clips may require to pass through the membranes **136** and **138**. The membranes may be constructed of materials as disclosed herein.

Resulting building or shoring structures constructed using the gabion structure as illustrated in FIGS. **1** and **2** may be used singly or in Juxtaposition or superposition or in any other appropriate combination depending upon the requirement of the final structure.

The cage structure illustrated may be of any size. For example each hexagonal cavity may be of the order of 3 meters wide by 3 meters high. Erection is obtained on site quite simply by pulling the structure to the erected condition.

Any feature of any aspect of the invention described herein can be used with any one or more of the features of any one or more of the other aspects of the invention as described herein.

The flexible material used in connection with the invention may include or comprise a layer of metallic foil, provided with apertures to allow liquid to drain therethrough. If the foil is used on its own the apertures therein must be of a size to allow liquid to drain therethrough but must hold back the filling material, which must be selected accordingly.

Also as an outer layer of the flexible material there cab be used the matting known as ANKERMAT which comprises coiled plastics filaments which can hold soil to make the block to be surfaced with soil to enable the growing of a grass covering thereover.

I claim:

1. A method of providing an on-site structural block comprising:

transporting to the site a cage structure in a collapsed flattened condition, said cage structure adapted to be filled with a filling material in order to provide a structural block, said cage structure comprising pivotally interconnected panels of open work mesh; and

filling the cage at least partially with fluent solid material of a size too great to pass through the meshes of the cage, wherein the cage is erectable to the shape of the block to be provided by moving the panels apart, said panels comprising side panels defining side walls and end panels defining end walls pivotally interconnecting the side walls, said side and end walls being folded concertina fashion when the cage is in the collapsed condition, the cage being erectable into a condition for filling whereby the cage defines at least one cavity for receiving the filling material.

2. The method according to claim **1**, wherein the panels of the cage structure further comprise partition panels pivotally interconnecting the side walls, and the cage is erectable into a condition for filling whereby the cage defines a row of side-by-side cavities for receiving the filling material.

3. The method according to claim **2**, further comprising providing the cage structure with interconnected side panels and partition panels, and erecting the cage by moving the panels apart into a condition for filling whereby the cage defines a row of side by side hexagonal cavities for receiving the filling material.

4. The method according to claim **2**, further comprising providing a flexible cord which passes through the partition panels and is connected thereto, and erecting the cage by pulling on the cord to move the partition walls apart and to unfold the side wall panels in sequence.

5. The method according to claim **1**, wherein the filling material is taken from any of, or any mixture of, rubble, aggregate, stones, or the like.

6. The method according to claim **1**, wherein the block is a wall structure.

7. The method according to claim **1**, wherein the block is a shoring structure either by itself or in conjunction with other suitable blocks arranged adjacent thereto or on top thereof.

8. An improved cage structure of interconnected open mesh work panels, said improved cage structure comprising:

a.) first and second end panels;

b.) first and second side panels; and

c.) at least one partition panel;

wherein said cage structure is transformable between a flattened condition and an erected condition, wherein said erected condition of said cage structure defines an upright block having corners with said first and second end panels forming first and second end walls and said first and second side panels forming first and second side walls, said end walls and said side walls being interconnected at said block corners, and each said partition panel being connected to and extended between said side walls so as to divide said cage structure into a plurality of cavities which may be filled with a filling material so as to produce a structural block;

the improvement being that said side panels, said end panels, and each said partition panel are permanently pivotally interconnected in both said flattened condition and said erected condition so as to allow said cage structure to be transformed from said flattened condition to said erected condition by relatively pivoting said end panels and said side panels.

9. The cage structure according to claim **8**, wherein each said side panel is made up of permanently pivotally inter-

connected side panel sections which lie folded concertina fashion in said flattened condition.

10. The cage structure according to claim **9**, wherein each said partition panel is permanently pivotally interconnected to said side panels where said side panel sections are permanently pivotally interconnected to each other.

11. The cage structure according to claim **8**, wherein each said side panel is a single flat side panel having its two ends permanently pivotally interconnected to said first and second end panels, respectively.

* * * * *

Int. Cls.: 6 and 19

Prior U.S. Cls.: 1, 2, 12, 13, 14, 23, 25, 33 and 50

United States Patent and Trademark Office

Reg. No. 3,219,415
Registered Mar. 20, 2007

TRADEMARK
PRINCIPAL REGISTER

MIL

HESCO BASTION LIMITED (UNITED KINGDOM CORPORATION)
UNIT 37, KNOWSTHORPE GATE CROSS GREEN INDUSTRIAL ESTATE
LEEDS, UNITED KINGDOM LS9 0NP

FOR: BASTIONS AND GABIONS AT LEAST PARTLY OF METAL; BASTION AND GABION DEFENSE WALLS AT LEAST PARTLY OF METAL; METALLIC CAGE STRUCTURES AND MULTI-COMPARTMENTAL CAGE STRUCTURES FOR FORMING BASTIONS AND GABIONS; METALLIC CLIPS AND FASTENERS FOR INTERCONNECTING COMPONENT PARTS OF BASTION OR GABION STRUCTURES; COMPONENT PARTS OF ALL THE AFORESAID GOODS, IN CLASS 6 (U.S. CLS. 2, 12, 13, 14, 23, 25 AND 50).

FOR: NON-METALLIC BASTIONS AND GABIONS; NON-METALLIC BASTION AND GABION DEFENSE WALLS; NON-METALLIC CAGE STRUCTURES AND MULTI-COMPARTMENTAL CAGE STRUCTURES FOR FORMING BASTIONS AND GABIONS; NON-METALLIC CLIPS AND FASTENERS FOR INTECONNECTING COMPONENT PARTS OF BASTION OR GABION STRUCTURES; COMPONENT PARTS OF ALL THE AFORESAID GOODS, IN CLASS 19 (U.S. CLS. 1, 12, 33 AND 50).

THE MARK CONSISTS OF STANDARD CHARACTERS WITHOUT CLAIM TO ANY PARTICULAR FONT, STYLE, SIZE, OR COLOR.

PRIORITY CLAIMED UNDER SEC. 44(D) ON ERPN CMNTY TM OFC APPLICATION NO. 4023231, FILED 9-13-2004, REG. NO. 004023231, DATED 1-3-2006, EXPIRES 9-13-2014.

SER. NO. 78-574,318, FILED 2-24-2005.

ANNE FARRELL, EXAMINING ATTORNEY

ACS Holdings USA, LLC

A Service Disabled Veteran Owned Small Business

Milibastion® Defense Systems

- The patented* Milibastion® Defense System provides an effective solution to personnel and asset protection worldwide.
- Milibastion® was developed specifically to address military requirements to provide a rapid-deploy perimeter defense system, able to withstand realistic field conditions.
- Milibastion® was developed in Colombia to protect US and host nation forces. It has successfully been field tested against a variety of weapon systems.
- In addition to perimeter defense, Milibastion® components can be configured into fighting positions and other protective structures to provide a full solution as required by the user.
- Milibastion® is unique in its defensive characteristics. During assembly, the building blocks transform to create a monolithic structure, adaptable to meet circumstantial demands.
- In addition, Milibastion® has proven durable in desert, mountain, sea-side, and jungle environments.
- Milibastion® is made in the USA and Colombia.
- Milibastion® is available in three options:
  - Ready-to-Assemble – containerized flat packed components with field instructions
  - Field Training/Design Support – Our technicians assist and train field personnel
  - Full Field Assembly – Turn-key Design/Build delivery

* US Patent Pending, Colombian Patent awarded May 2007

vchristman@acs-holdings.com Washington DC Phone: **202-470-3953** 1/25/2008 ACS.MRK.BFI.0014

ACS

Our Services

ACS is a multi-discipline construction and manufacturing oriented Service Disabled Veteran Owned Small Business based out of the United States. We support an operating branch located in Bogotá, Colombia and have a focus on the international community. Our services include:

- Manufacturing and Installing of Milibastions® Patented Defense Systems
- In House Architecture & Engineering Design Services
- Fast Track & Turnkey Design-Build Construction and Management
- Project Investment and Management

Please see the respective sections for additional information about specific services and products.

Our Team

ACS is a newly organized company comprised of seasoned professionals and field tested experts. In addition to the direct experience of each individual, the majority of our team has work together on previous projects.

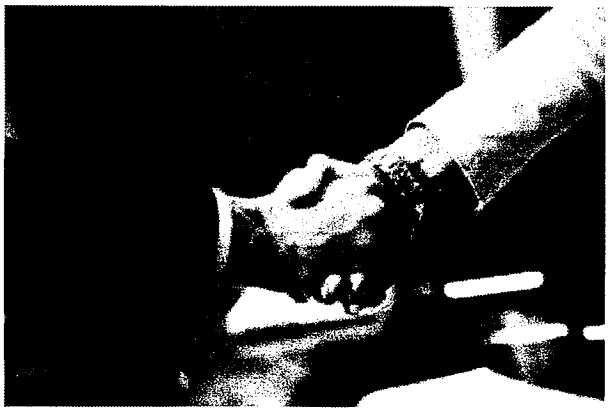
Consequently, while ACS has little direct experience as a legal organization, the team, both individually and collectively, has considerable relevant experience in an array of construction-oriented contracting services.

We are also proud to say that as of the 1st of January 2008, ACS Holdings USA, LLC bought the Milibastions product line and key personnel have carried over to join us.

Our Clients

In the past, ACS personnel have completed projects for government, commercial, and personal entities. A great deal of our work has been contracted through the United States Government. ACS is a Service Disabled Veteran Owned Small Business, and thus we anticipate many new opportunities to prove our capabilities and the quality of our services. We are also eager to bring existing commercial entities to Latin America.

Please read the pages herein to learn more about our services and products.

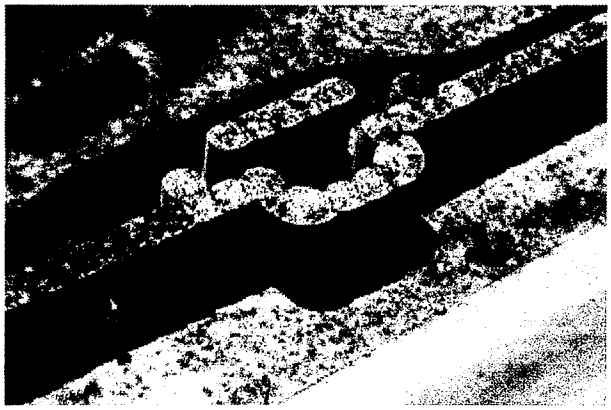


Introduction

Our Milibastions® Patented Defense System is an easy-to-install force protection unit that has been specifically designed for military use in remote and hostile environments. The method is simple; you setup the bastion and fill it with earth materials - dirt, sand, gravel, etc. This line of innovative earth-filled bastion products may be used for many types of force protection and building configurations; the many uses will be further explained in the products section below.

Milibastions® is effective because it is easily transported to remote locations, rapidly deployable, extremely protective and cheap in comparison to other forms of protection. Milibastions® products have and will continue to protect soldiers and personnel that work in hostile environments.

Products



Currently the Milibastions® Patented Defense Systems product line consists of more than 70 items. We don't simply create force protection walls with the purpose of base perimeter protection; products range from walls, bunkers, towers, barracks, kitchens, bathrooms, offices, etc. On top of that, most items may be customized with shooting ports, mesh shields, barbwire, camouflage and more. We continue to expand our product line and ultimately strive to bring quality solutions and functional products to our clients and those on the front lines.

Click here if you are interested in learning more about Milibastions® Products.

Services

Milibastions® products come in a variety of service packages which include the following:

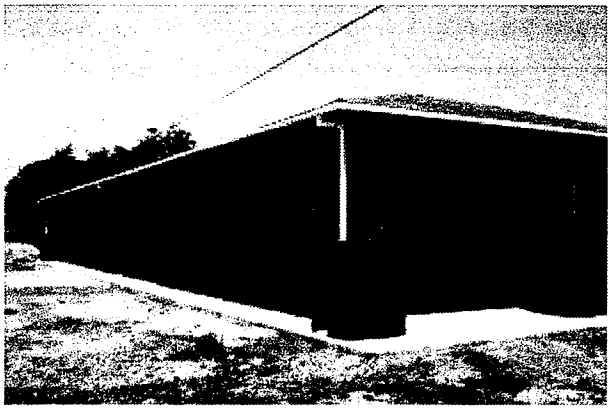
Ready to Assemble
Manufacture and shipment of Milibastions® products. An installation manual and all required pieces are provided.

Training & Engineering
This kit provides hands-on training and supervision of labors. It also provides engineering services to deal with technical issues.

Complete Installation
Also known as a turnkey installation; a team will be sent to the location and install all pieces of the product. From the drawing board to the ribbon cutting.

Click here for complete information about our service packages.

Experience



The Milibastions® Patented Defense Systems product line has been installed and proven for a number of clients. To date, most of these procurements have been awarded through government sources, specifically with the military related sections of the United States Government, such as NAS.

These contracts have been processed in Colombia, where we maintain a branch office. However, ACS is now ramping up for the international market, supporting and protecting various entities all over the globe. Currently we are exploring the options of moving our production to the United States.

Click here to view past projects related to Milibastions® Patented Defense Systems.

Milibastions® Experience

Before reading the following experience, please allow us to better acquaint you with our company and our personnel.

ACS is a fairly new company, having come into legal status in mid 2007. However, our staff has been working together in previous companies and on projects for some years. Thus, a large part of our experience has been 'transplanted' from pre-ACS projects through the direct and critical involvement of our personnel in these projects.

The Milibastions® Product line was invented by Jorge Gallego and Cesar Giraldo of Arquitecsa. We are proud to state that in January of 2008, ACS Holdings USA, LLC brought all rights to the Milibastions® product line. The Arquitecsa staff has also decided to make the merge with our company. Thus we have adopted a new branch of business, and with it, years of hands-on experience.

From this combination of old and new comes our slogan - "A Young Company ... With Veteran Experience."

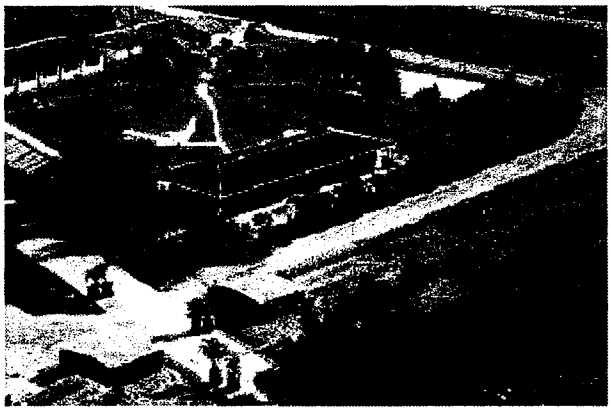
To see more specific information regarding this list of experience, including the exact roles that ACS personnel have held in these projects, please login.

Anti-Narcotics Police Base Fortifications

Client: CNP / NAS
Location: Bogota, Colombia
Value USD: $1,000,000 - $5,000,000
Year Awarded: 2007

Project Description: This was an IDIQ contract with the NAS of the U.S. Embassy in Bogota. Contracts consisted of supply and installation of Milibastions® products throughout militarized areas in Colombia.

Anti-Narcotics Police Base Fortifications



Client: CNP / NAS
Location: San Jose del Guaviare, Putumayo
Value USD: Less than $500,000
Year Awarded: 2007

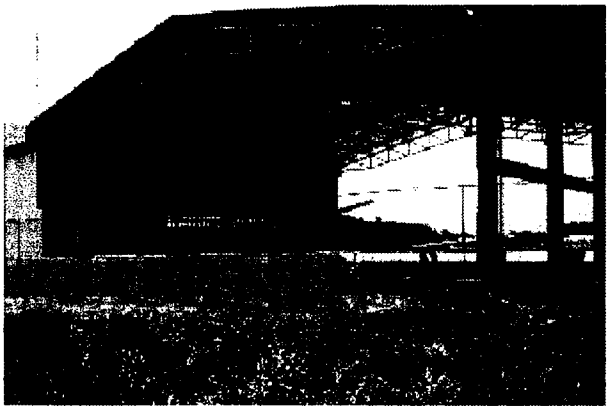
Project Description: This was an IDIQ contract with the NAS of the U.S. Embassy in Bogota. Contracts consisted of supply and installation of Milibastions® products throughout militarized areas in Colombia.

Anti-Narcotics Police Base Fortifications

Client: CNP / NAS
Location: Pijaos, Espinal, Tolima
Value USD: Less Than $500,000
Year Awarded: 2007

Project Description: This was an IDIQ contract with the NAS of the U.S. Embassy in Bogota. Contracts consisted of supply and installation of Milibastions® products throughout militarized areas in Colombia.

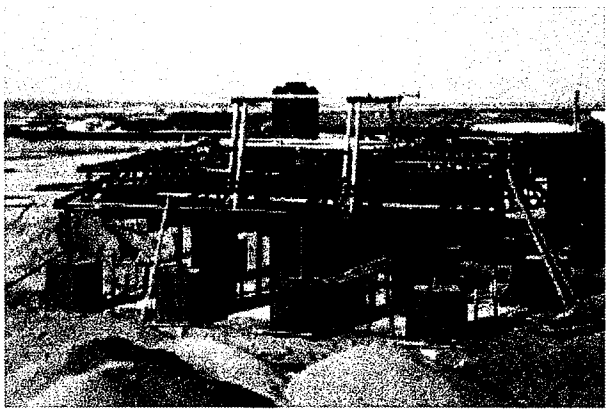
Air Force Bastion Walls



Client: CAF / NAS
Location: Apiay, Colombia
Value USD: Less than $500,000
Year Awarded: 2007

Project Description: This contract consisted of the delivery and installation of 8 ft high bastion wall kits for perimeter wall force protection at the Apiay Colombian Air Force Base.

Anti-Narcotics Police Base Fortifications



Client: CNP / NAS
Location: Puerta Estrella, Guajira
Value USD: Less than $500,000
Year Awarded: 2007

Project Description: This contract consisted of the delivery and installation of a level IV, 32 man barrack. This kit came with 6 fire ports and the level IV class roof protection, the IED Shield.

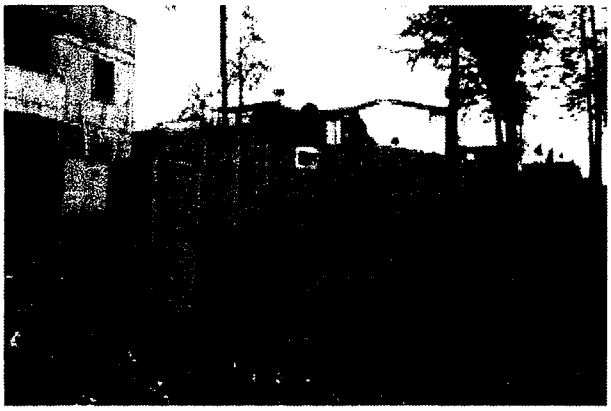
Police Base Sniper Shooting Range

Client: CNP / NAS
Location: Pijaos, Espinal, Tolima
Value USD: Less than $500,000
Year Awarded: 2007

Project Description: This contract consisted of the installation of 8 ft high walls, earth protection slopes and Milibastions® force protection systems.

These components were assembled to setup a sniper range.

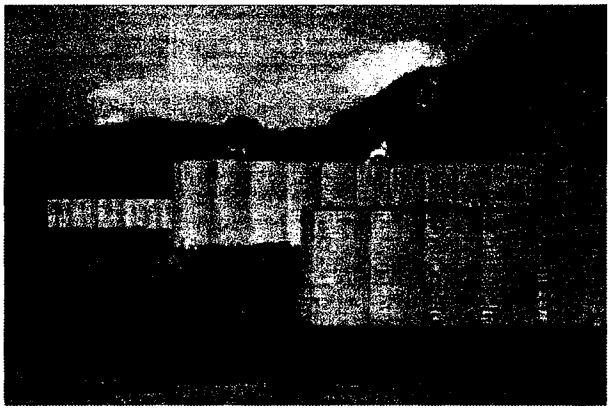
Police EMCAR Bunkers & Perimeter Walls



Client: CNP / NAS
Location: Pijaos, Espinal, Tolima
Value USD: Less than $500,000
Year Awarded: 2007

Project Description: This contract consisted of 8 ft perimeter walls with fire port installations and a level V two story bunker and 3 level III single story bunkers. Some segments of the wall were installed to 12 ft high.

Police Base COR Shooting Ranges



Client: CNP / NAS
Location: Pijaos, Espinal, Tolima
Value USD: Less than $500,000
Year Awarded: 2006

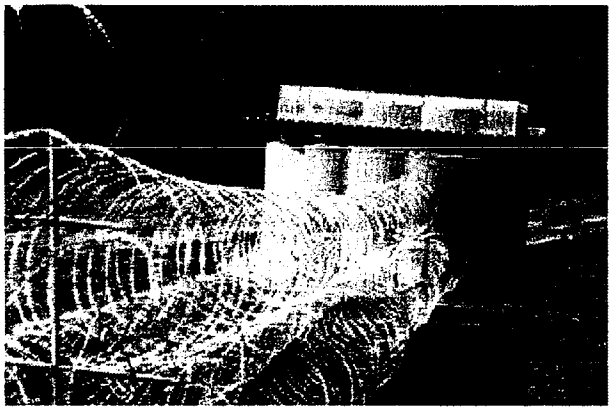
Project Description: This contract consisted of the installation of 8 ft high bastion walls for the COR and EMCAR shooting ranges at the Colombian National Police base in Pijaos.

Anti-Narcotics Police Base Fortifications

Client: CNP / NAS
Location: Pijaos, Espinal, Tolima
Value USD: Less than $500,000
Year Awarded: 2006

Project Description: This project consisted of the installation of 8ft wall kits and 5 level III bunkers for 3 individuals each.

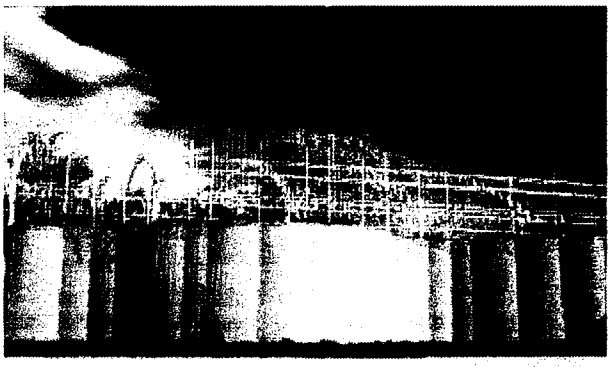
Barb Wire Supply



Client: MilGroup
Location: San Jose del Guaviare, Putumayo
Value USD: Less than $500,000
Year Awarded: 2006

Project Description: This contract consisted of the supply of barb wire to the U.S. MilGroup in Bogota, Colombia.

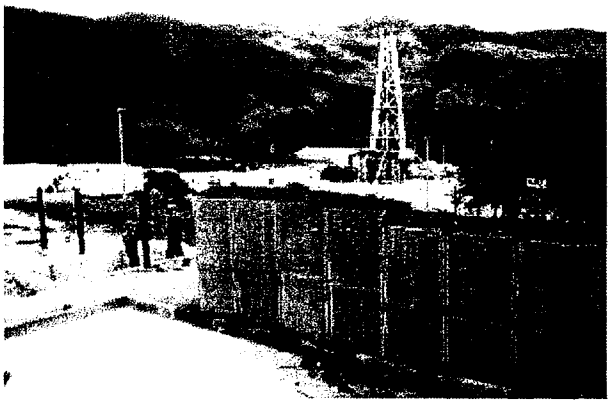
Explosives Warehouse Perimeter Shielding



Client: Cerrejon Coal LLC
Location: Colombia
Value USD: Less than $500,000
Year Awarded: 2006

Project Description: This contract consisted of the supply and construction of ammunition bunkers, bastion perimeter walls and IED shields.

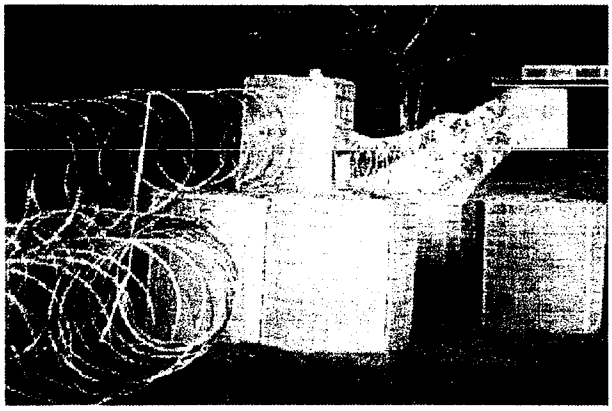
Army Barracks Perimeter Wall



Client: Termotecnica Consorcio Homero
Location: Petrobras Drill Site
Value USD: Less than $500,000
Year Awarded: 2006

Project Description: Supply and construction of perimeter bastion walls and IED shields for protection of an army base at Petrobras Drill Site.

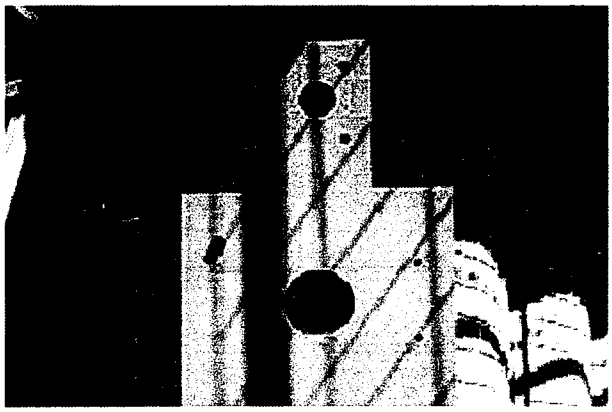
Barb Wire Supply



Client: NAS
Location: Bogota, Colombia
Value USD: Less Than $500,000
Year Awarded: 2006

Project Description: This contact consisted of the supply of barb wire to the Narcotics Affairs Section at the U.S. Embassy in Bogota, Colombia.

Steel Target Supply



Client: NAS
Location: Bogota, Colombia
Value USD: Less Than $500,000
Year Awarded: 2006

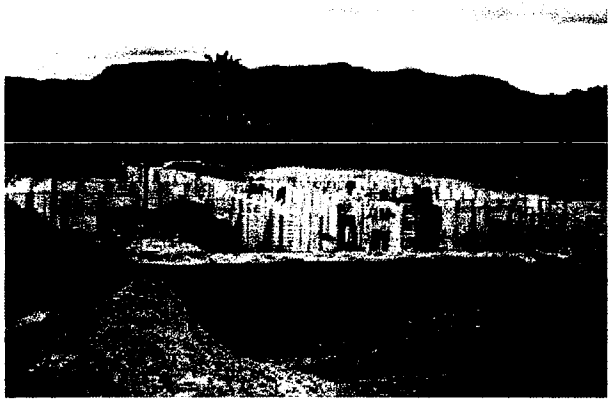
Project Description: Supply of steel shooting targets of the Narcotics Affairs Section at the U.S. Embassy in Bogota, Colombia.

2005 - 2006 IDIQ Supply Orders

Client: NAS
Location: Militarized Locations, Colombia
Value USD: Less Than $500,000
Year Awarded: 2005

Project Description: This was an IDIQ contract which consisted of the supply and fill of bastion walls, bunker kits and fire support positions. Physical upgrades were completed in various police and military bases across the nation.

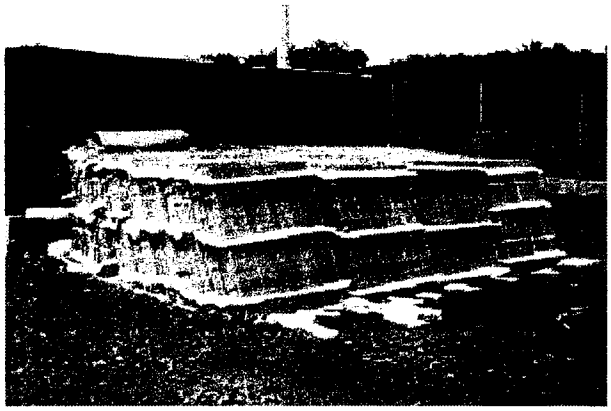
Police Training Center



Client: NAS
Location: Bogota, Colombia
Value USD: Less Than $500,000
Year Awarded: 2005

Project Description: This contract consisted of the supply of Milibastions® perimeter walls and bunker kits to the Narcotics Affairs Section at the U.S. Embassy in Bogota, Colombia.

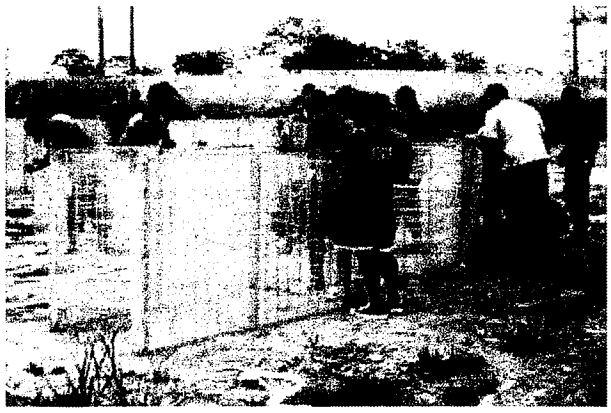
Explosive Magazine Fortified Warehouses



Client: Carbones del Cesar
Location: Mina la Francia, El Paso
Value USD: Less Than $500,000
Date Awarded: 2005

Project Description: This project consisted of the supply and installation of ammunition bunkers and bastion perimeter walls.

Police Base Reinforcements



Client: CNP / NAS
Location: Choco
Value USD: Less than $500,000
Year Awarded: 2005

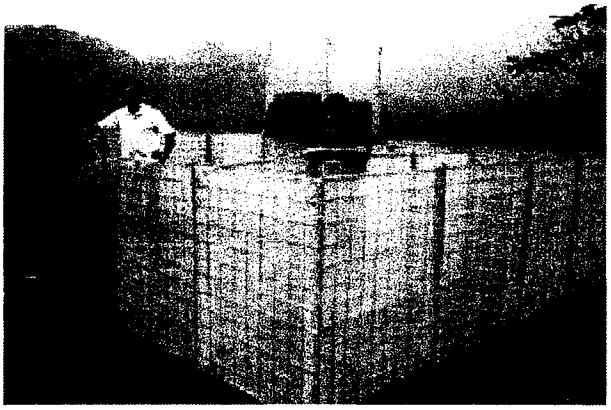
Project Description: This contract consisted of the supply of bastion perimeter walls and bunker kits for the Narcotics Affairs Section at the U.S. Embassy in Bogota, Colombia. These products were installed in Choco department.

Police School Assembly

Client: NAS
Location: Yuto, Choco
Value USD: Less than $500,000
Year Awarded: 2005

Project Description: This contract consisted of the supply of Milibastions® perimeter wall and bunker kits to the Narcotic Affairs Section in Bogota, Colombia. These systems were installed in Yuto, Choco.

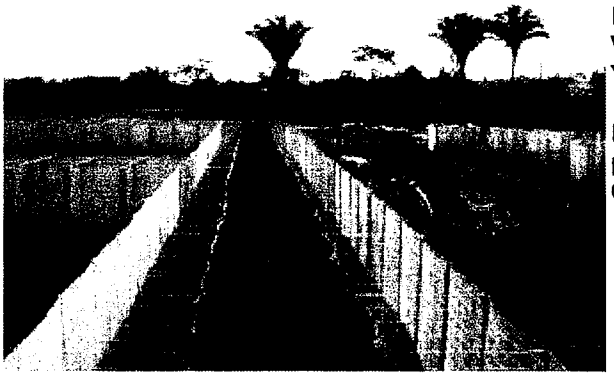
Police Base Installments



Client: NAS
Location: Guarato, Choco
Value USD: Less than $500,000
Year Awarded: 2005

Project Description: This contract consisted of the supply of Milibastions® perimeter wall and bunker kits to the Narcotic Affairs Section in Bogota, Colombia. These systems were installed in Guarato, Choco.

Police Base EMCAR Installments



Client: NAS
Location: Colombia
Value USD: Less than $500,000
Year Awarded: 2005

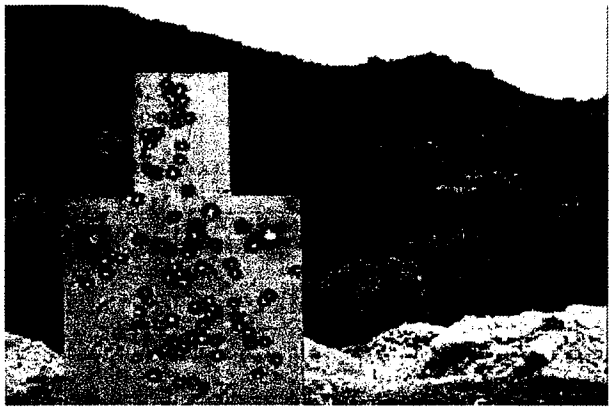
Project Description: This contract consisted of the supply of Milibastions® perimeter wall and bunker kits to the Narcotic Affairs Section in Bogota, Colombia.

Anti-Narcotics Police Base Fortifications

Client: NAS
Location: Santa Marta, Colombia
Value USD: Less than $500,000
Year Awarded: 2005

Project Description: This contract consisted of the supply of Milibastions® perimeter wall and bunker kits to the Narcotic Affairs Section in Bogota, Colombia.

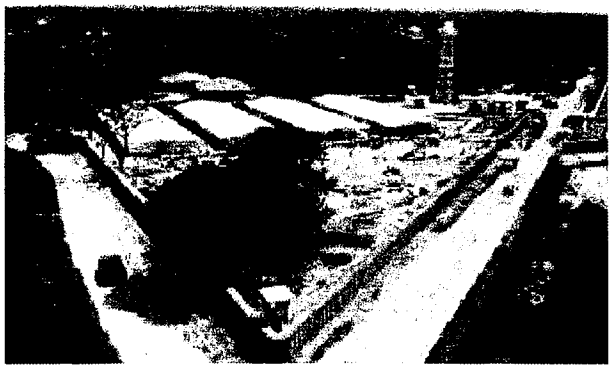
Steel Target Supply



Client: NAS
Location: Bogota, Colombia
Value USD: Less than $500,000
Year Awarded: 2005

Project Description: This contract consisted of the supply of Steel Targets to the Narcotic Affairs Section in Bogota, Colombia.

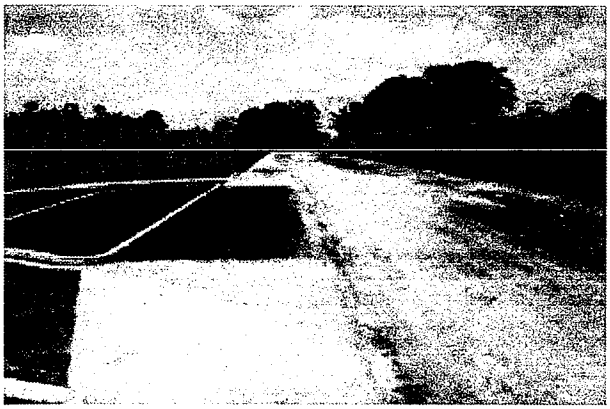
Army Base Barracks



Client: NAS
Location: Saravena, Colombia
Value USD: $1,000,000 - $5,000,000
Year Awarded: 2004

Project Description: This contract consisted of the fast track supply and installation of Milibastions® perimeter wall and barracks at the Army Aviation base in Saravena, Colombia.

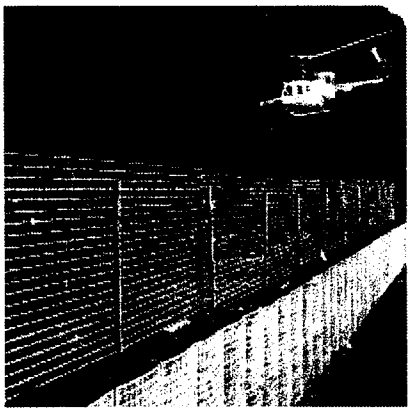
Army Aviation Base Reinforcements



Client: NAS
Location: Saravena, Colombia
Value USD: Less than $500,000
Year Awarded: 2004

Project Description: This contract consisted of the supply of Milibastions® perimeter wall and engineering / technical services to provide force protection upgrades at the Army Aviation base in Saravena, Colombia.

Walls

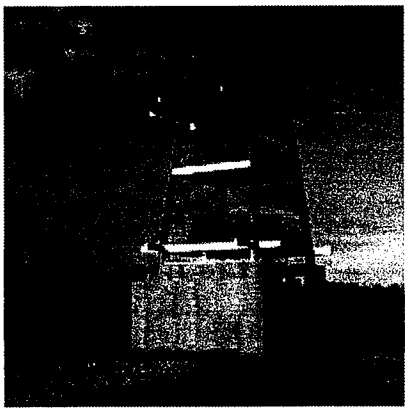


View Milibastions® Walls

Fire Positions

View Milibastions® Fire Positions

Towers



View Milibastions® Towers

Barracks

View Milibastions® Barracks.

Field Offices

View Milibastions® Field Offices.

Washrooms

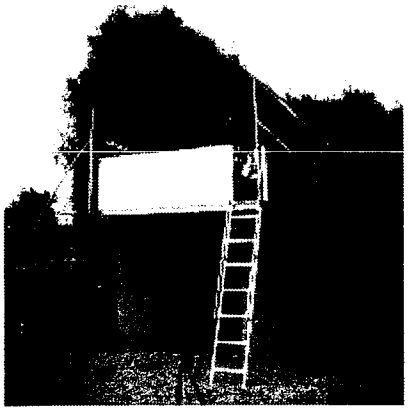
View Milibastions® Washrooms.

Kitchens

Roofing

Camouflage

View Milibastions® Kitchens.



View Milibastions® Roofing.

View Milibastions® Camouflage.

US 20050284080A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0284080 A1**

Gallego et al. (43) **Pub. Date: Dec. 29, 2005**

(54) **BASTIONS FOR FORCE PROTECTION AND MILITARY APPLICATIONS**

(76) Inventors: **Jorge Enrique Gallego**, Bogota (CO); **Cesar Giraldo**, Bogota (CO)

Correspondence Address:
KENYON & KENYON
ONE BROADWAY
NEW YORK, NY 10004 (US)

(21) Appl. No.: **10/879,678**

(22) Filed: **Jun. 29, 2004**

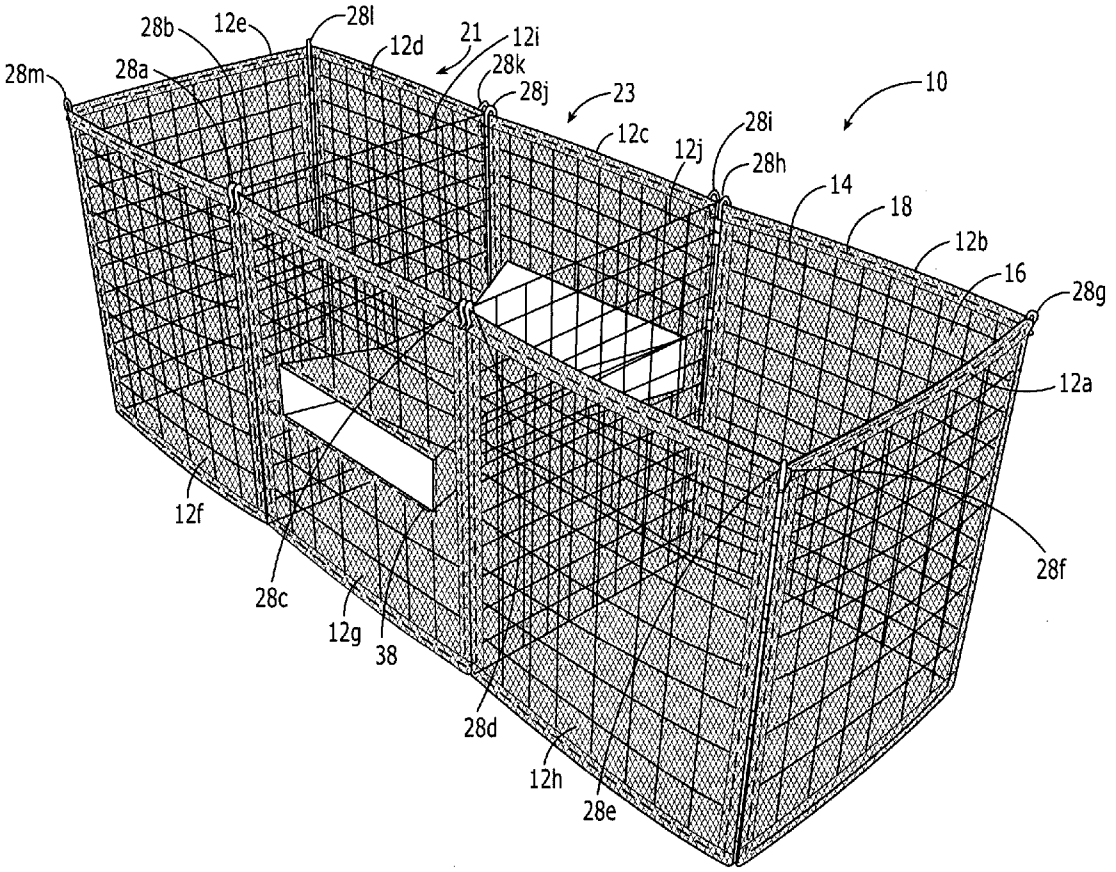
Publication Classification

(51) **Int. Cl.**[7] **E04H 12/00**

(52) **U.S. Cl.** **52/648.1**

(57) **ABSTRACT**

A bastion including one or more free-standing structures for use in, for example, military applications and for force protection. The free-standing structures are made up of a plurality of pivotally interconnected fire resistant mesh covered wire panels and are filled with, for example, sand, crushed rock or granular materials.



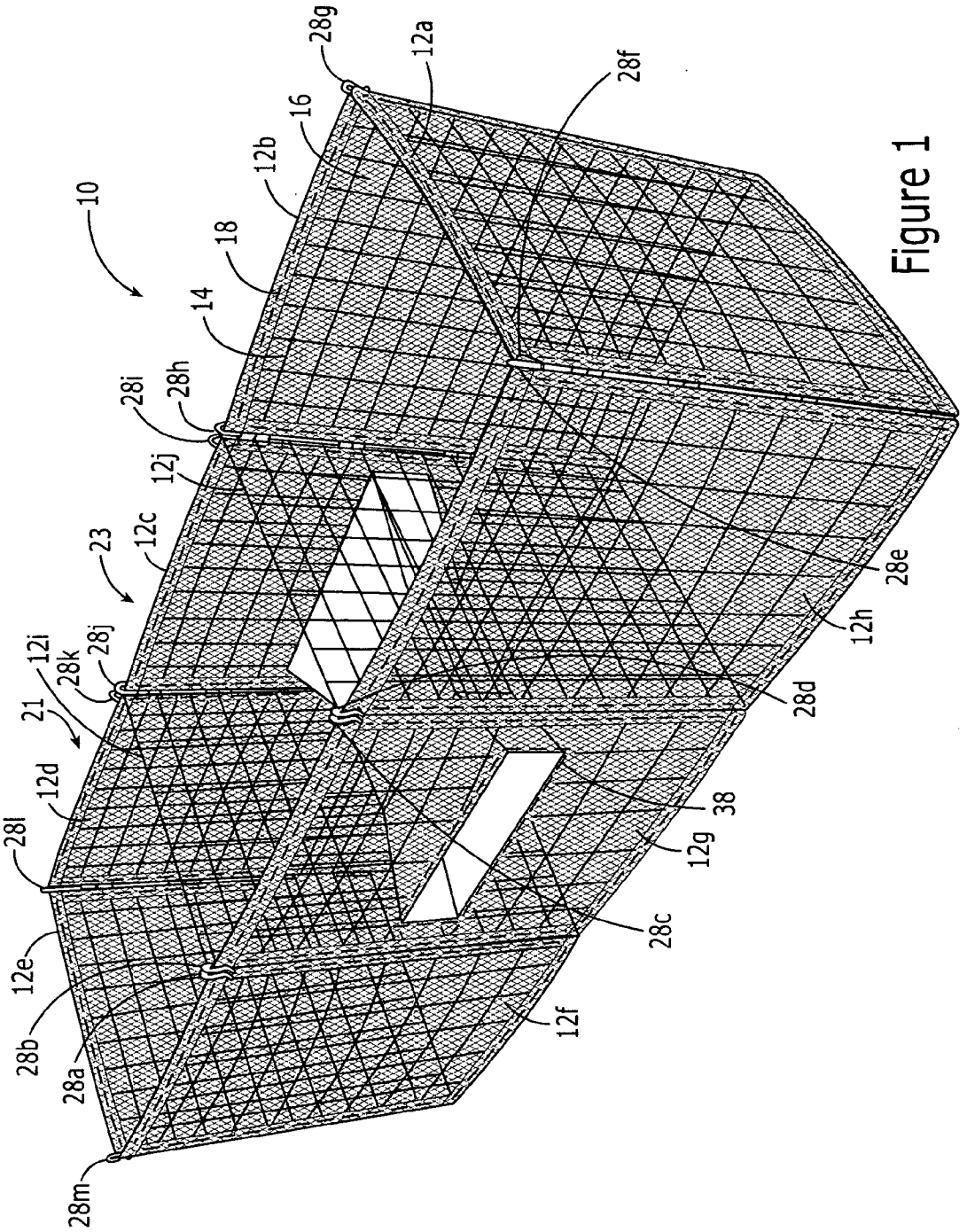

28g
12a
28f
16
12b
10
18
14
28i
28h
12j
23
12c
28j
12i
28k
21
12d
28l
12e
28b
28a
28m
28e
12h
28d
38
12g
28c
12f

Figure 1

Figure 2A

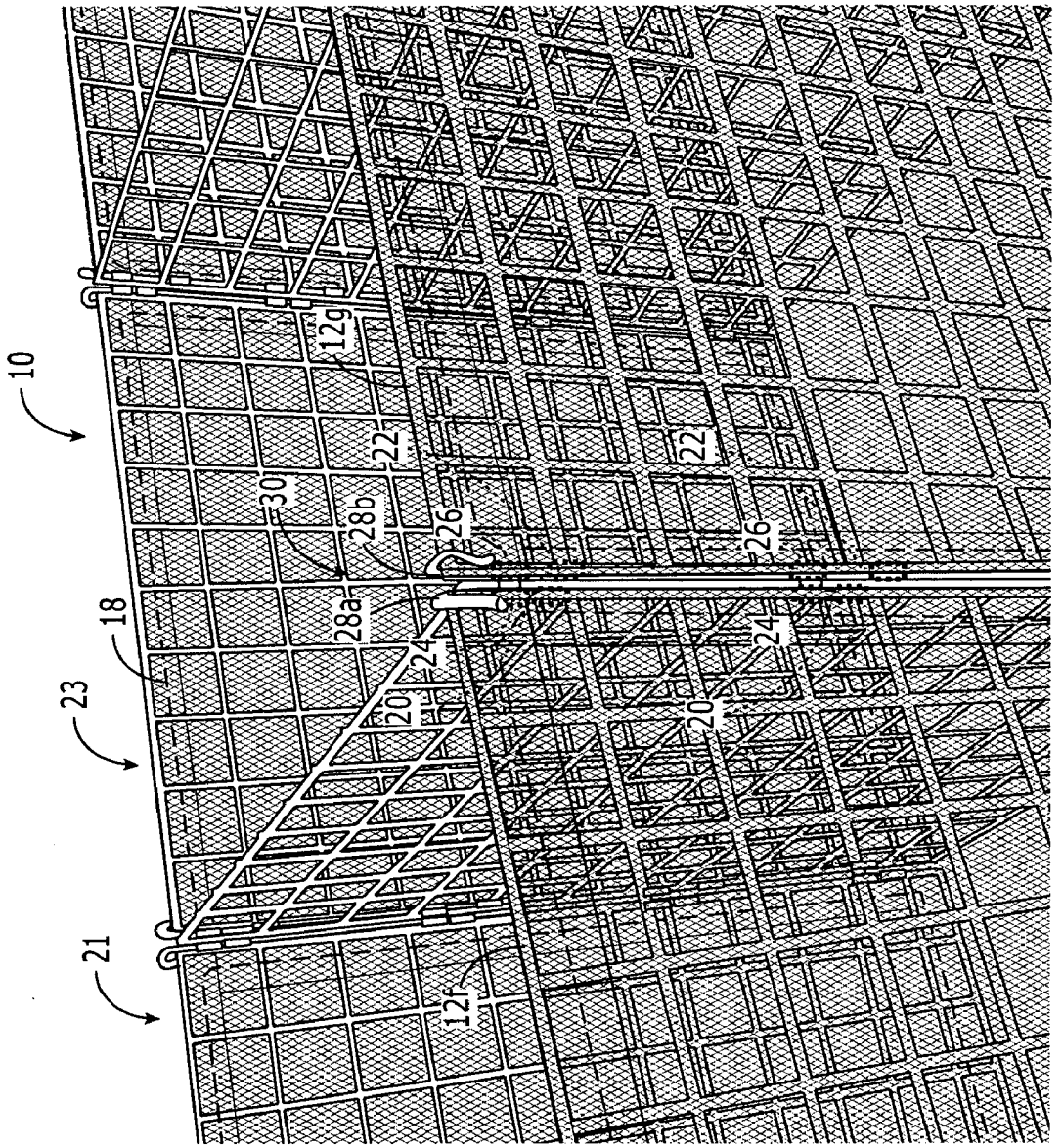
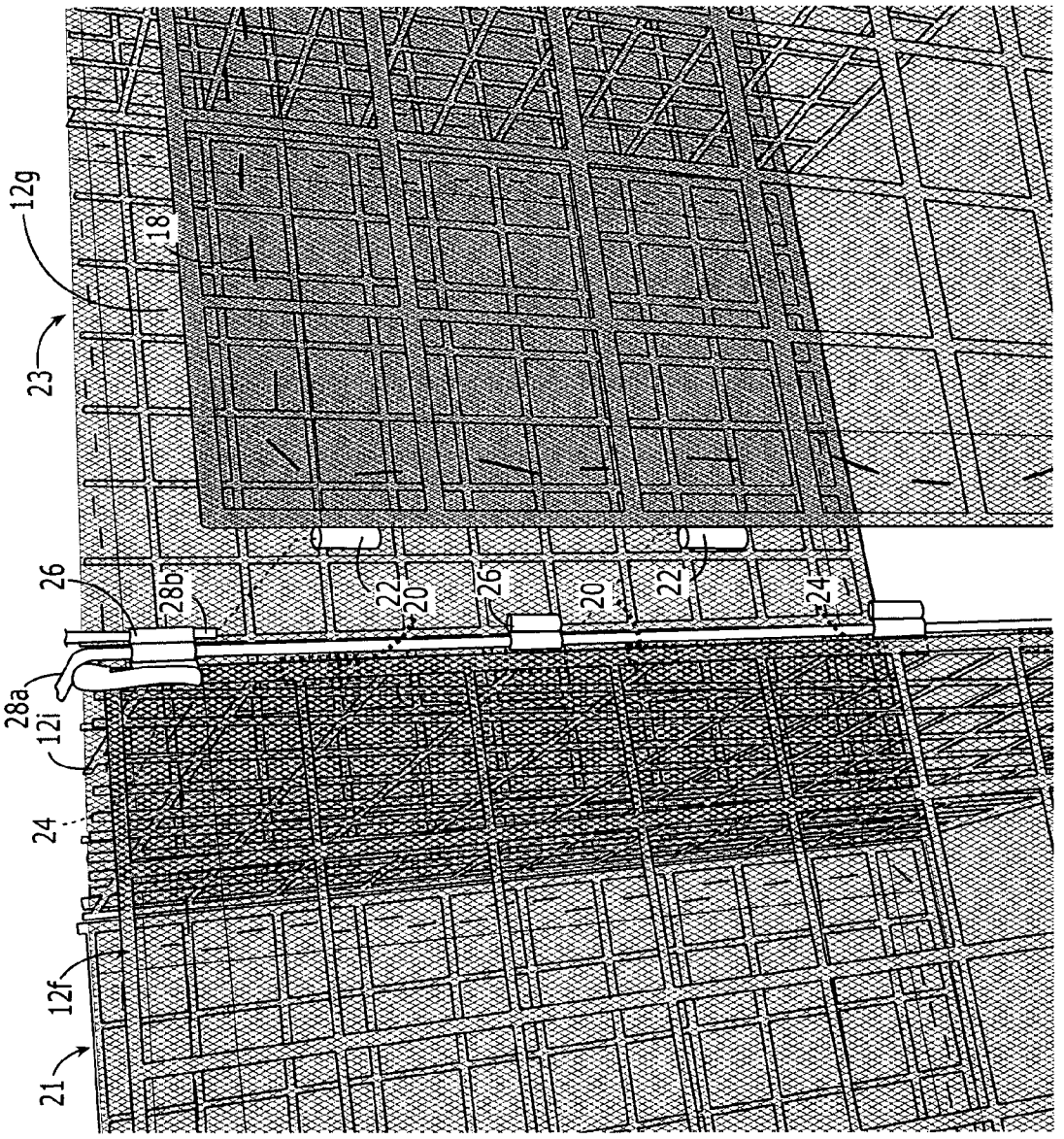


Figure 2B



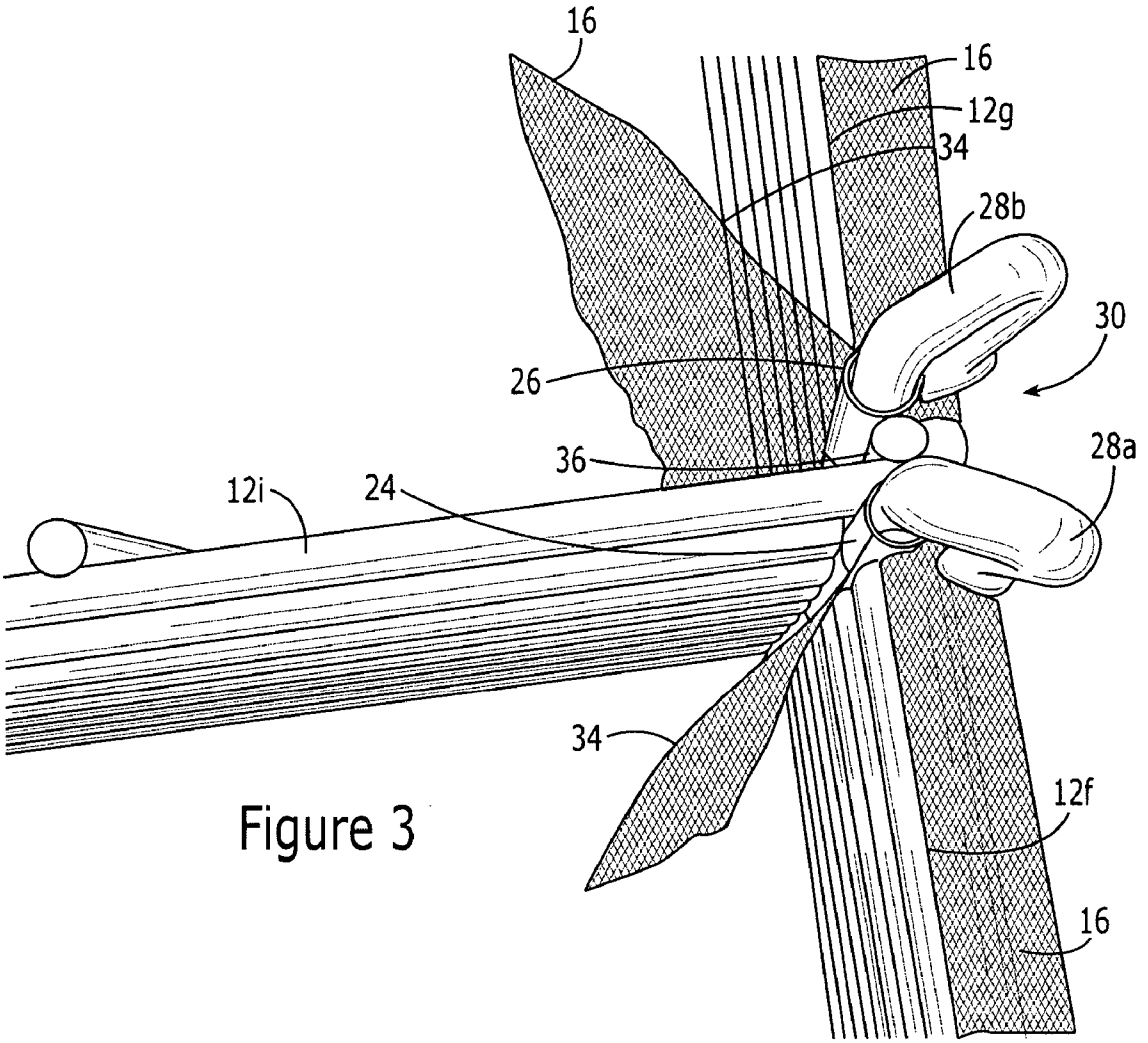


Figure 3

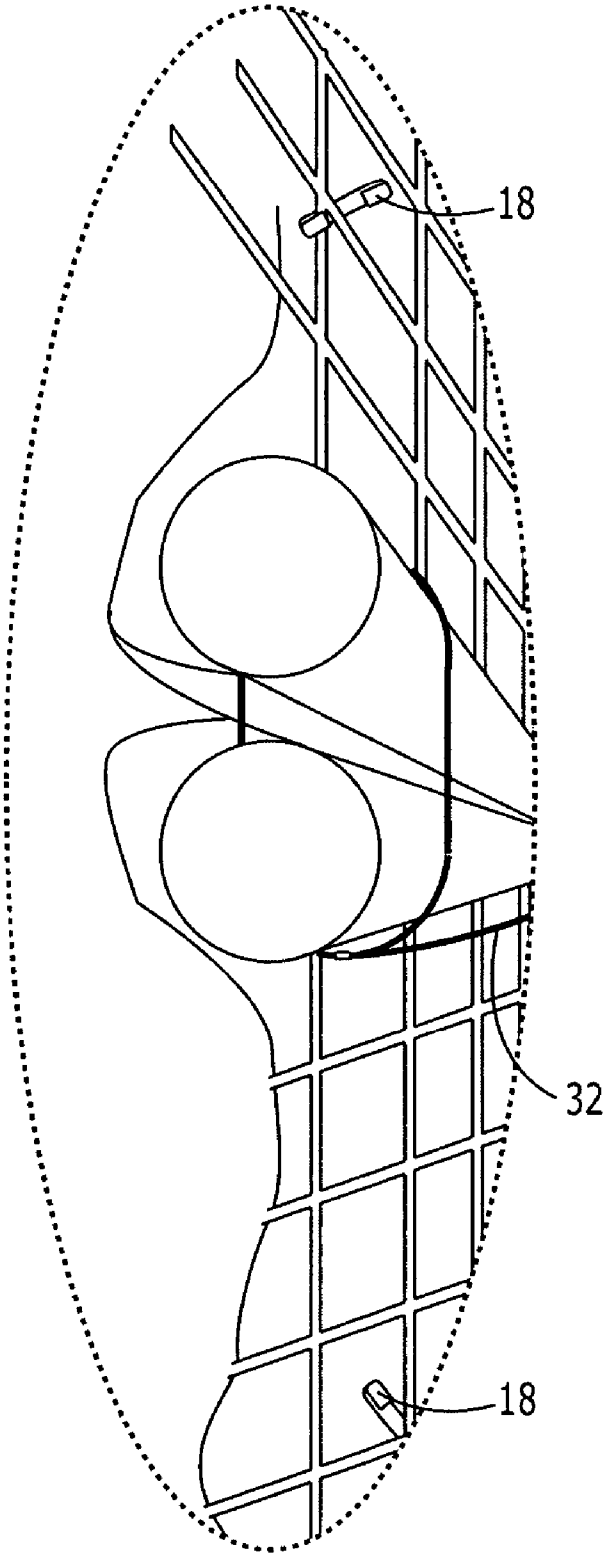


Figure 4

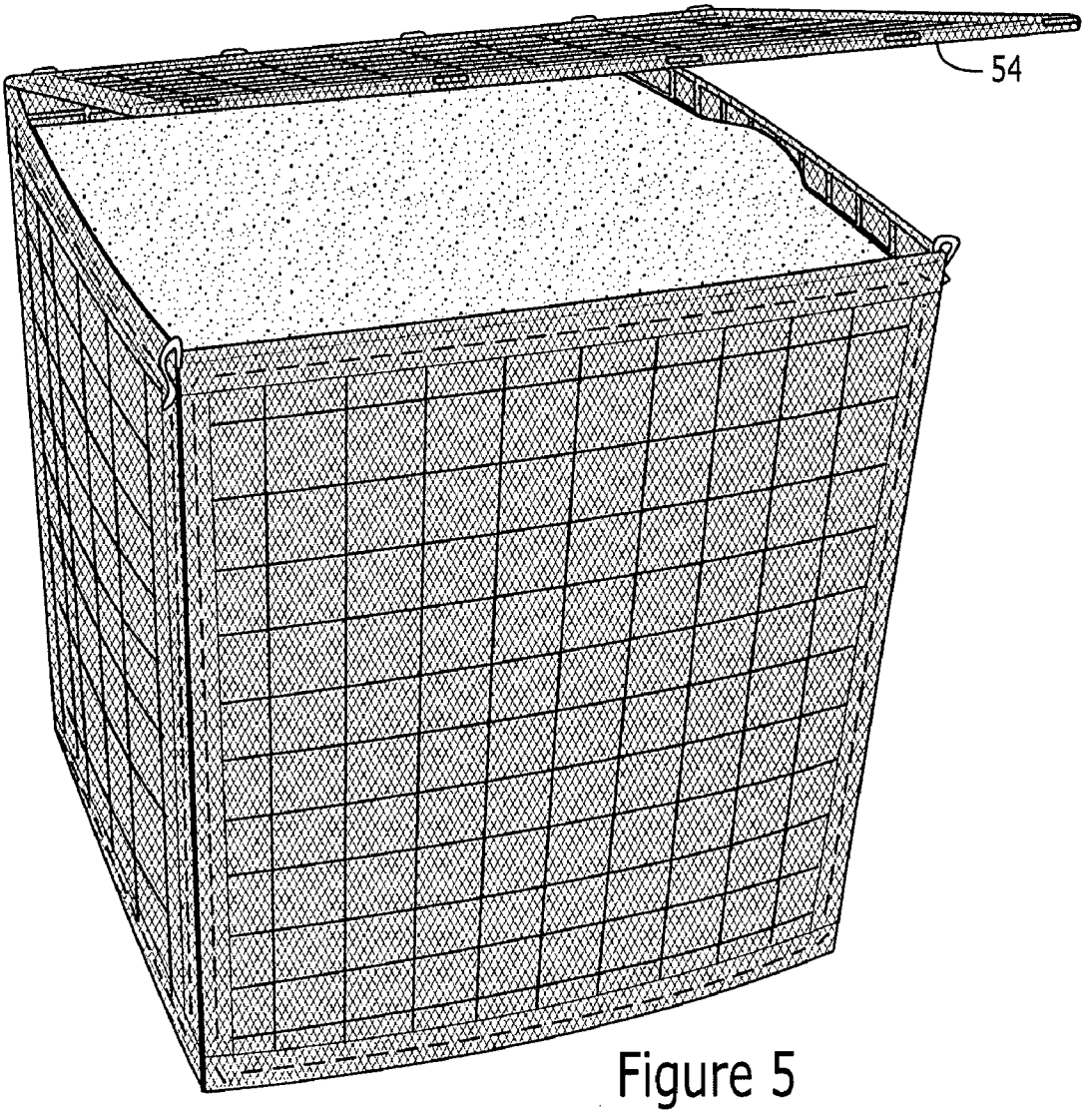


Figure 5

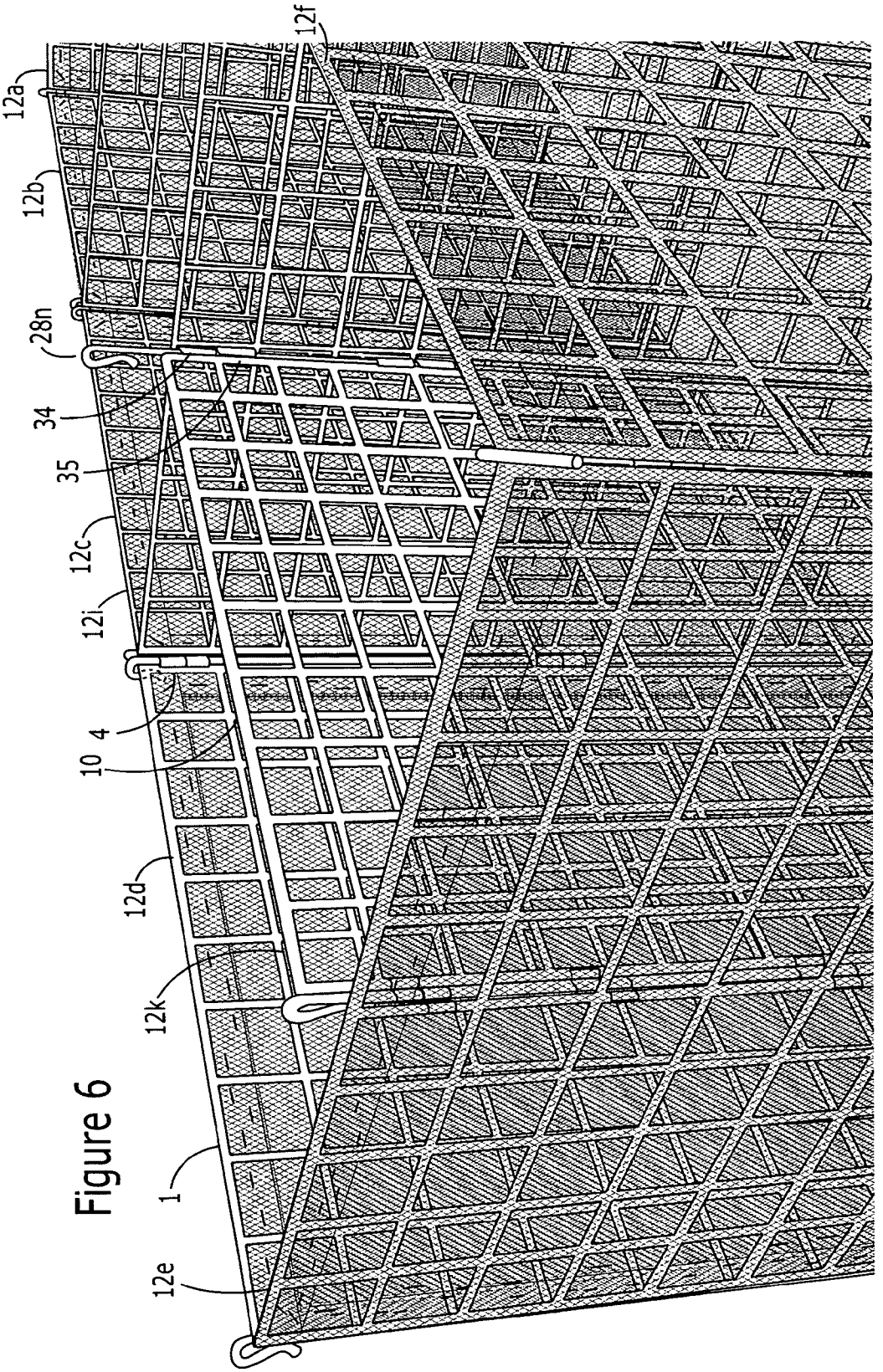


Figure 6

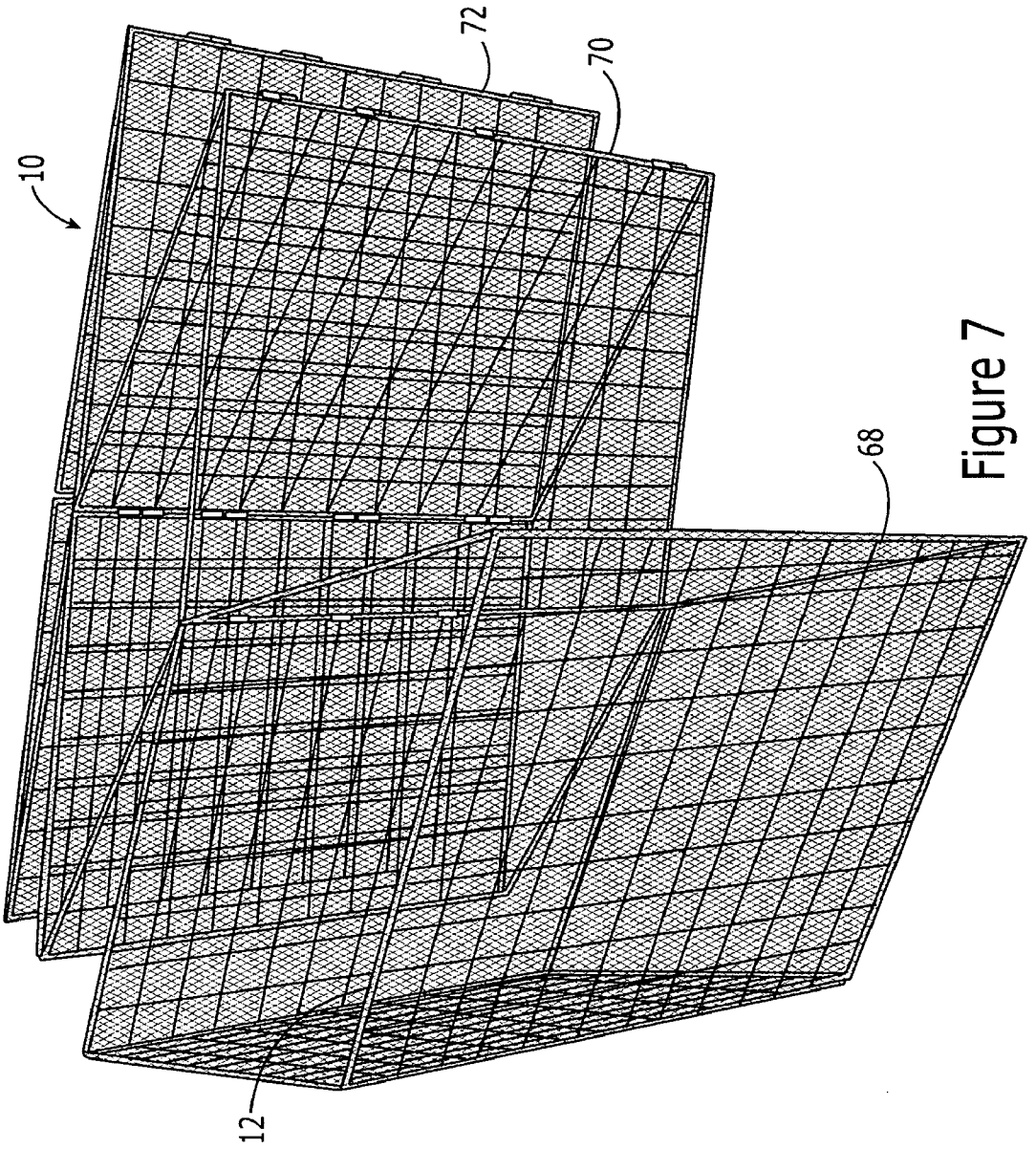
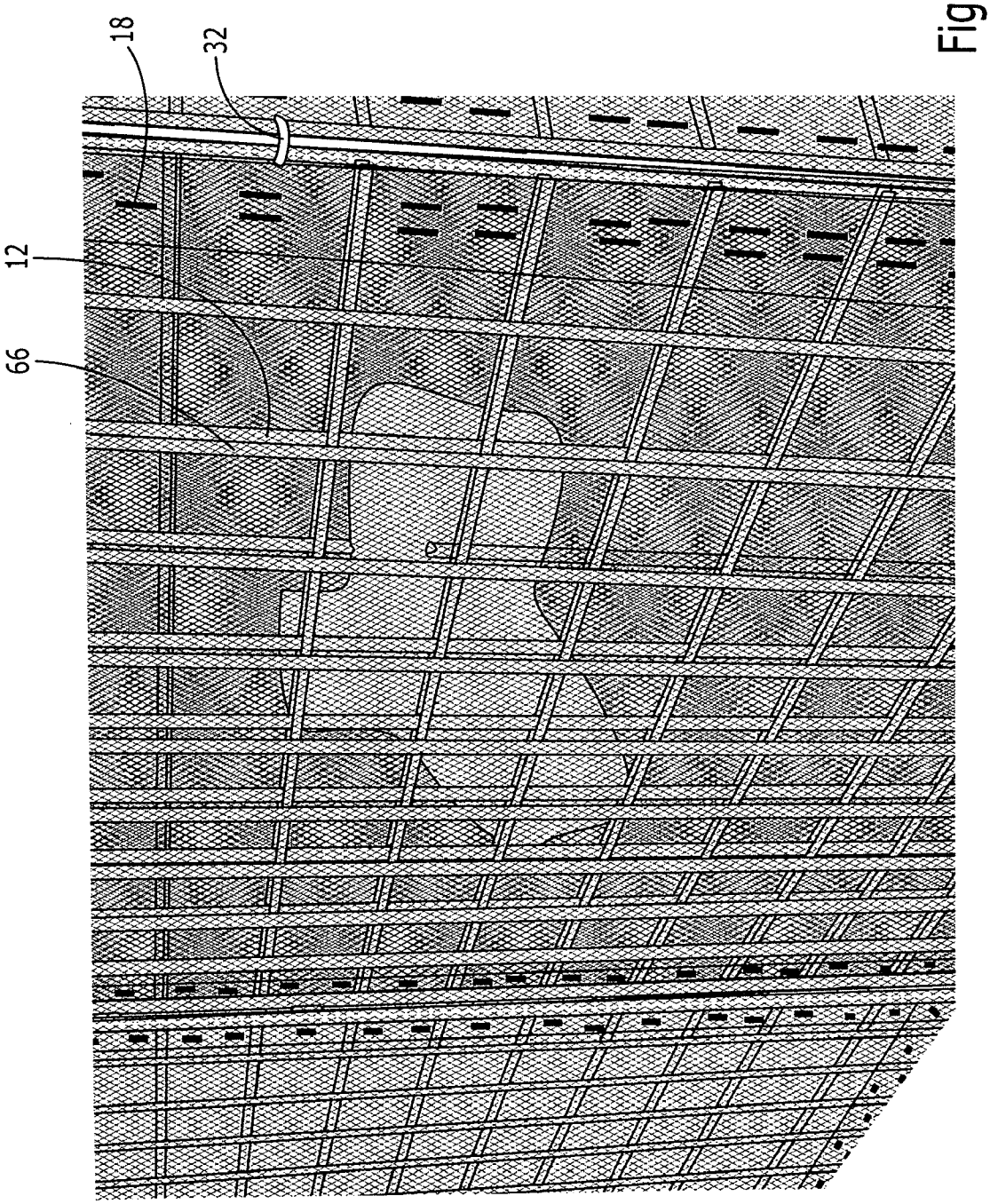


Figure 7

Figure 8



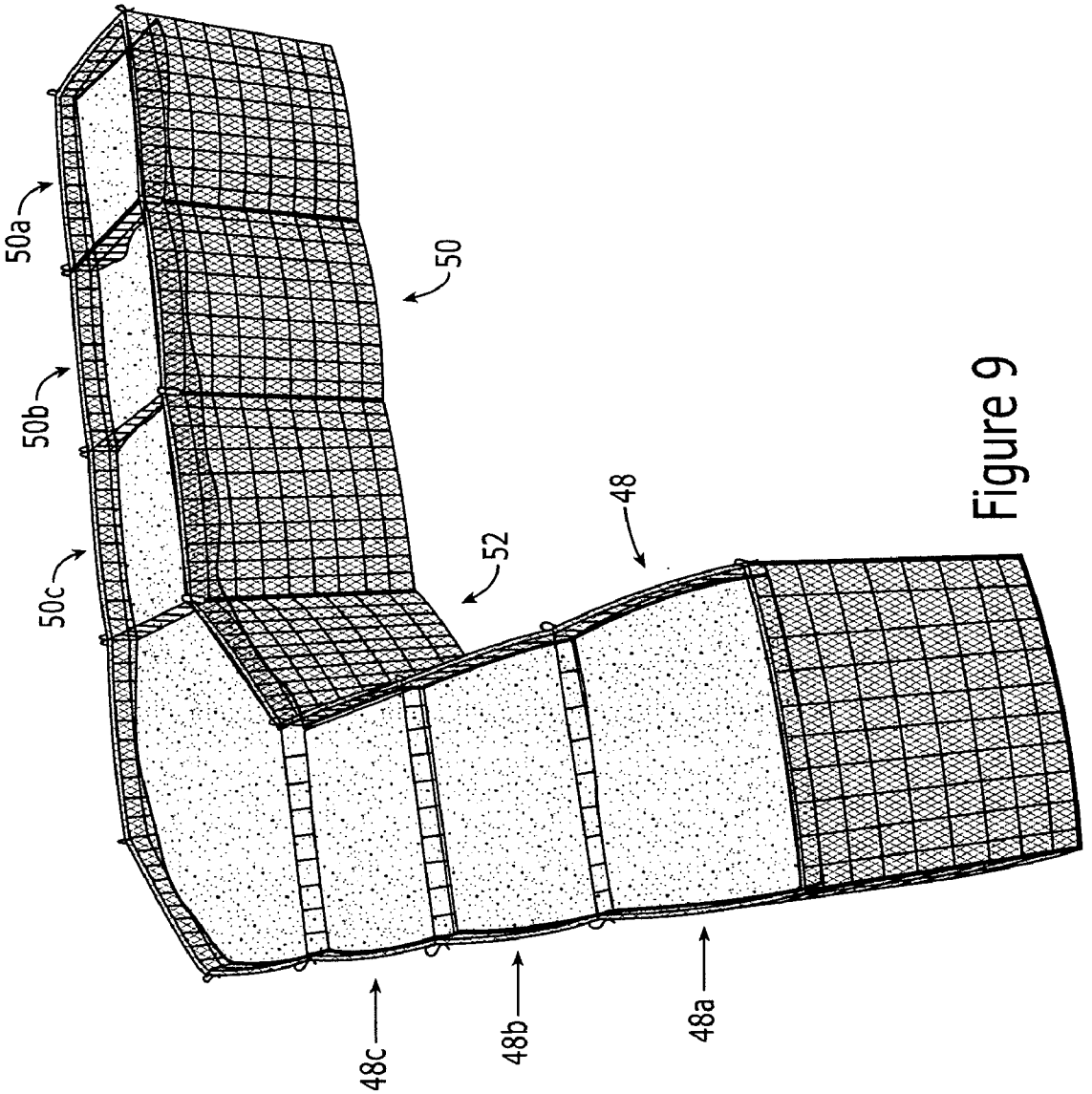


Figure 9

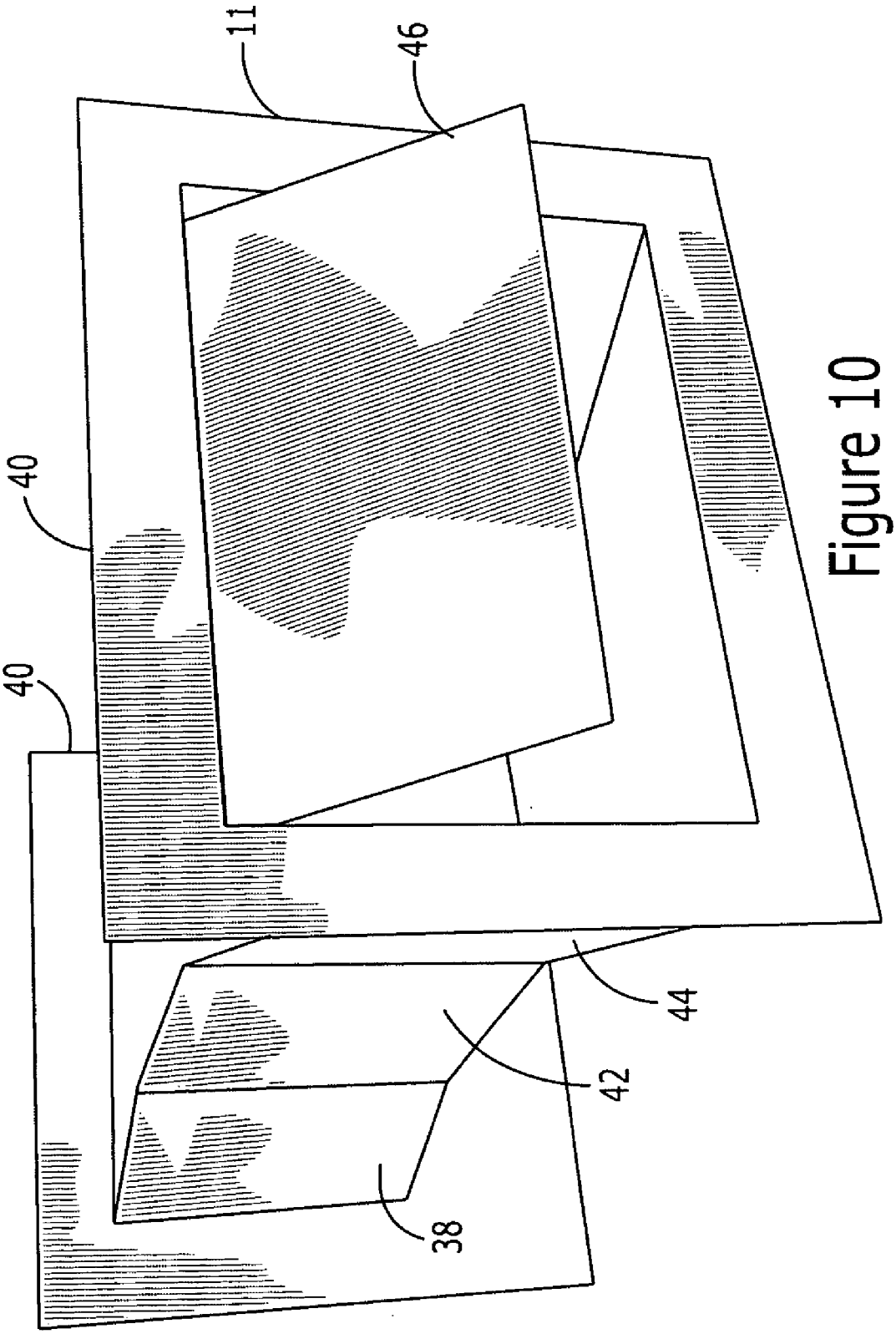


Figure 10

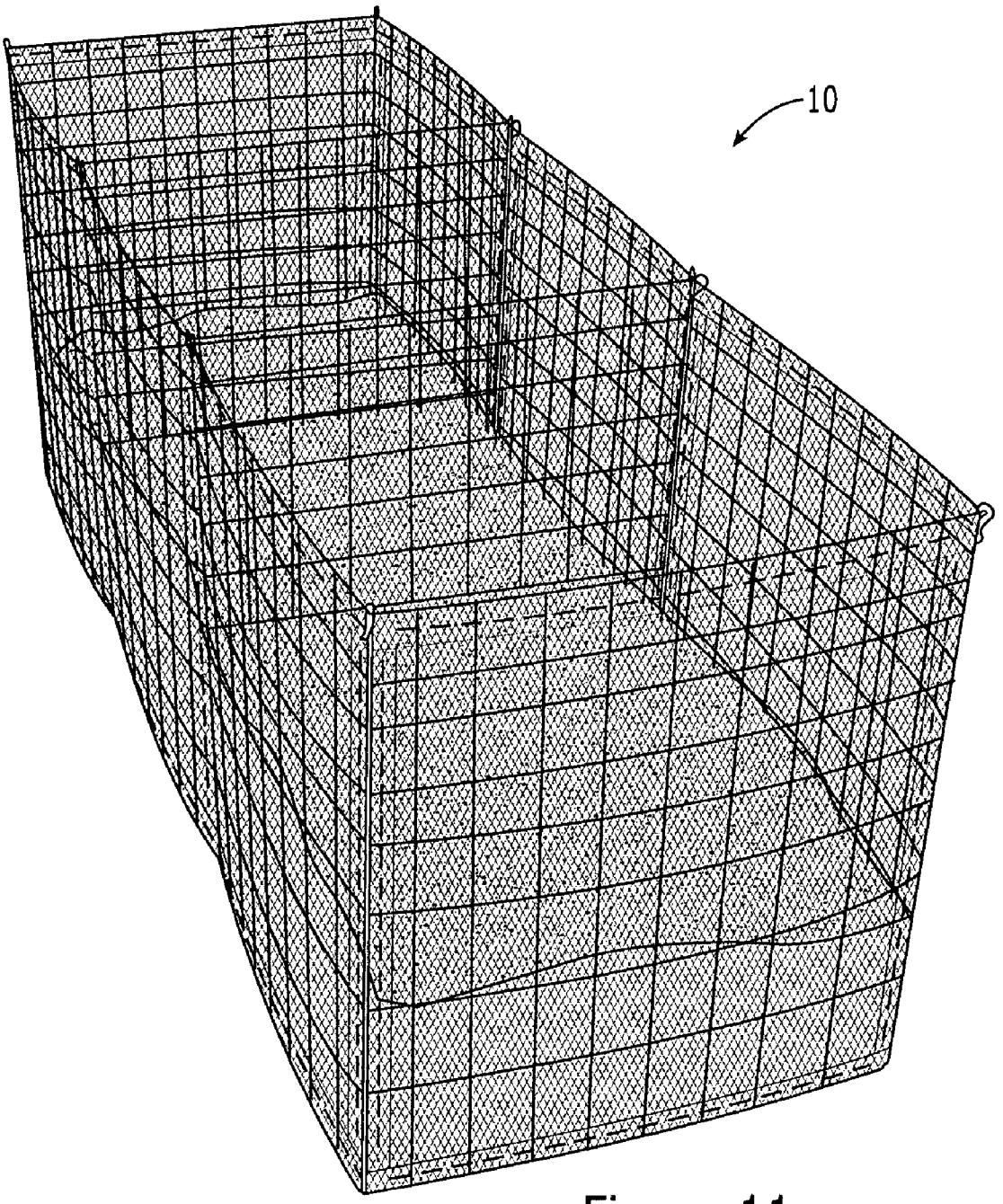


Figure 11

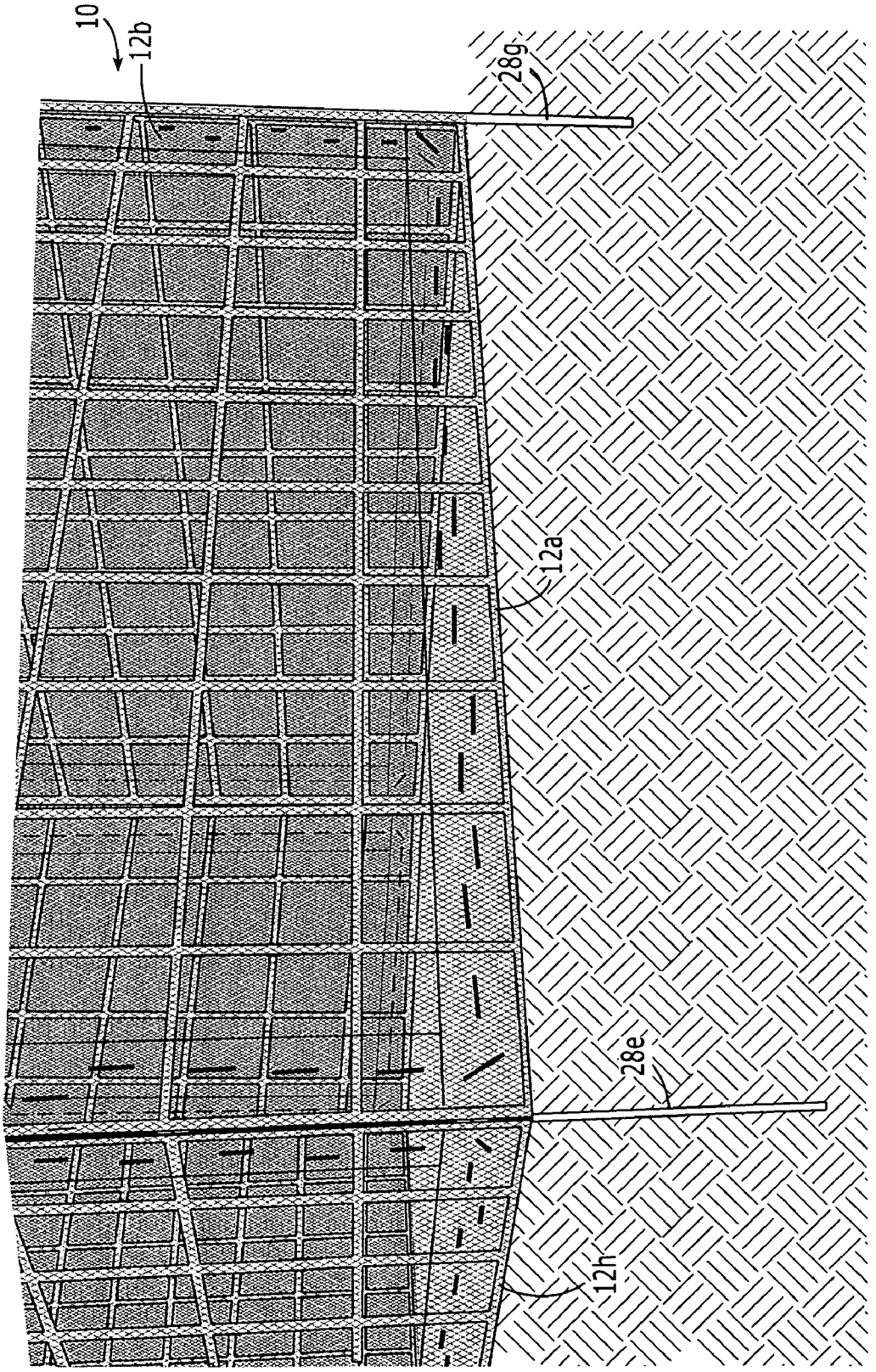


Figure 12

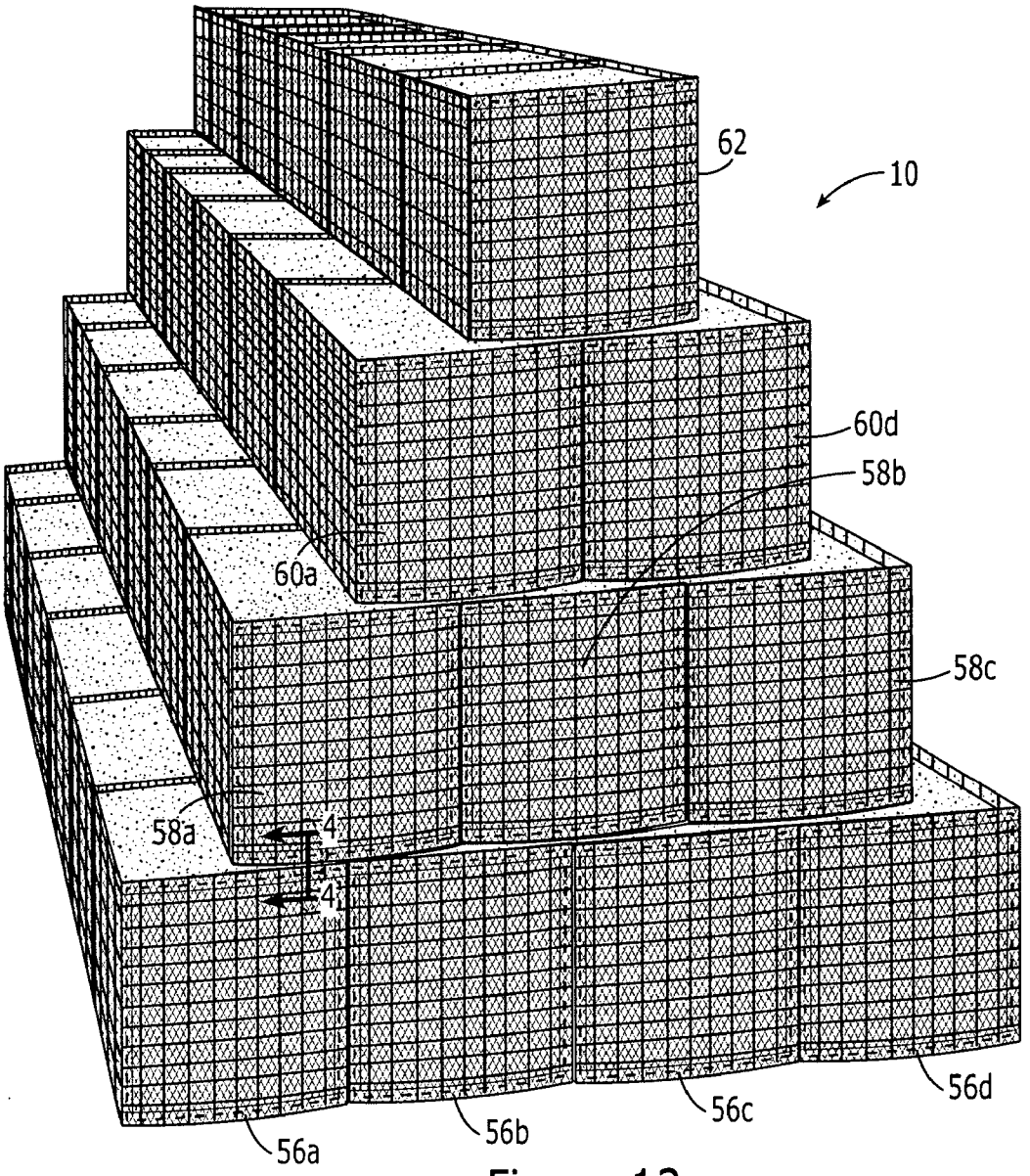


Figure 13

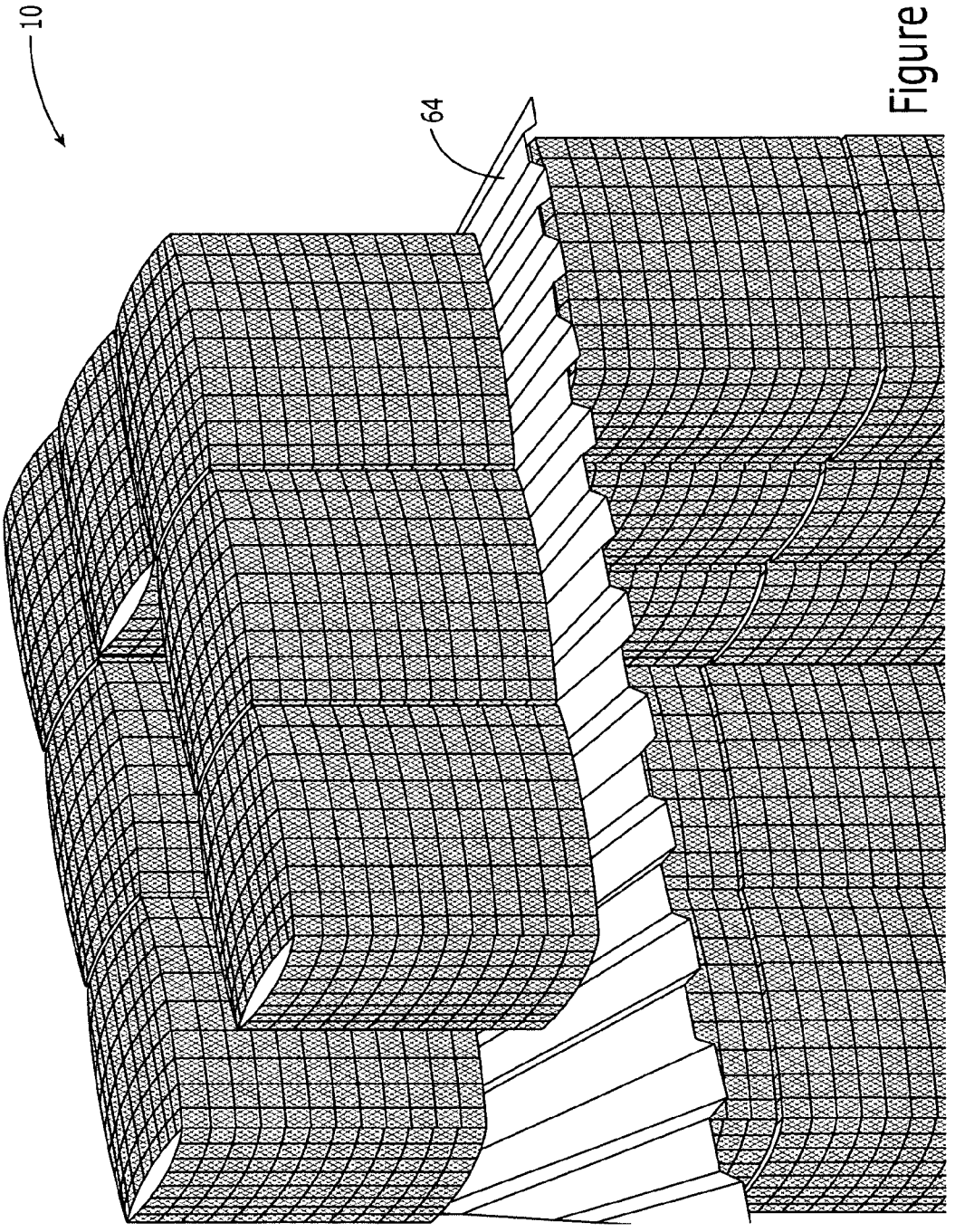


Figure 14

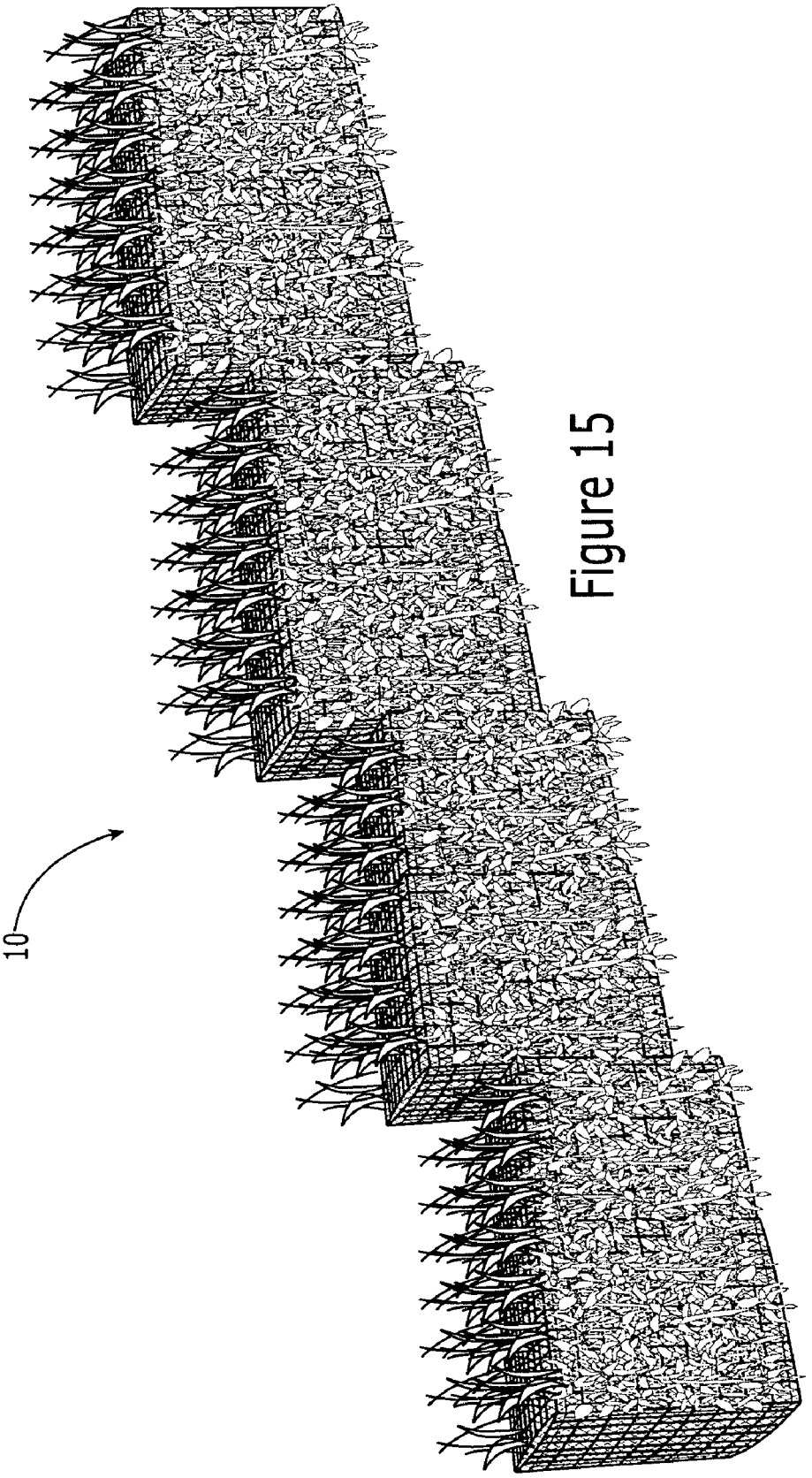


Figure 15

BASTIONS FOR FORCE PROTECTION AND MILITARY APPLICATIONS

FIELD OF THE INVENTION

[0001] The invention relates to a bastion. More particularly, the invention relates to a foldable multi-cell welded wire structures lined with an expanded or knitted wire mesh, which can be used, for example, for military applications and force protection.

BACKGROUND OF THE INVENTION

[0002] The use of bastions has been traditional ever since Roman times. In the seventeenth and eighteenth centuries it took the form of wicker baskets filled with earth or stones. In the early twentieth century, sand bags were used. In the later twentieth century bastions took the form of foldable gabion structures lined with geo-textiles.

[0003] This latter application, was basically the use of elements originally devised for civil works applied to the military use. This structure was rapidly deployable but its main failing was its lack of fire resistance. At best, a fire retardant composite was used in some situations to delay ignition. Use of flame throwers, incendiary bombs, Molotov cocktails and even tracer bullets of machine guns (one every seven in a belt loader) in combat situations destroys the protection afforded by this conventional bastion by igniting its lining or sand bags defenses.

[0004] Prior art protection barriers suffer from a number of additional drawbacks. Visual impact of prior art protection barriers is unsuitable for deployment within cities and the systems do not provide any concealment option. Deployment for long periods of time is also problematic given that barriers are exposed to environmental agents such as fungus, and UV attacks, that rapidly deteriorate them. Further, prior art protection barriers require intensive maintenance.

SUMMARY OF THE INVENTION

[0005] Accordingly, it is an object of the invention to produce a protection barrier or bastion which overcomes the above described prior art drawbacks.

[0006] A protection barrier or bastion according to an exemplary embodiment of the invention includes a foldable multi-cell structure, for example, for military and anti-terrorist use, consisting of structures conformed by hinged welded wire panels lined with knitted wire or expanded metal mesh, linked together to constitute a fire resistant cell structure. This structure is filled with sand, crushed rock or granular materials and may be camouflaged. Further, the multi-cell structure is deployable in flat or slopped terrain.

[0007] The expanded metal mesh or knitted wire mesh lining may withstand a flame thrower attack successfully, without losing particulate filling material through the openings. At the same time the expanded metal mesh or knitted wire mesh lining admits rooting of plants, which helps mitigate the visual impact of the bastions in the cities. Given the nature of the mesh, the plants will grow over the bastions, changing the hard appearance to look as natural fences melting them with the landscape.

[0008] The expanded metal mesh or knitted wire mesh lining materials are more suited to resist environmental attacks and are less maintenance demanding than prior art bastions.

[0009] The wall has a continuous volume, and therefore, behaves like a monolithic rather than an adobe like structure.

[0010] The infill continuity results in cavities or caverns created by impact of projectiles being filled by material coming from both damaged and adjacent cells, thus, improving the protection offered by the bastion.

[0011] The bastion may further include a hinged system that allows continuity of cells at different heights, and thus, for the possibility of deployment in slopped terrain.

[0012] To the accomplishment of the above and related objects the invention may be embodied in the form illustrated in the accompanying drawings. Attention is called to the fact, however, that the drawings are illustrative only. Variations are contemplated as being part of the invention, limited only by the scope of the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] In the drawings, like elements are depicted by like reference numerals. The drawings are briefly described as follows.

[0014] **FIG. 1** is a perspective of an exemplary embodiment of the bastion of the present invention.

[0015] **FIG. 2A** is a perspective view of the leftmost and middle cells in **FIG. 1**.

[0016] **FIG. 2B** is a perspective view of the leftmost and center cells in **FIG. 1** with an exterior panel in the middle cell disconnected.

[0017] **FIG. 3** is a top view of the hinge connecting exterior panels of the leftmost and middle cells.

[0018] **FIG. 4** is a cross sectional view taken along lines **4-4** in **FIG. 13**.

[0019] **FIG. 5** is a perspective view of a single bastion cell having a pivotally connected top.

[0020] **FIG. 6** is a perspective view of the leftmost cell of **FIG. 1**.

[0021] **FIG. 7** is a perspective view of an exemplary embodiment of a collapsible bastion.

[0022] **FIG. 8** is a perspective view of the rightmost cell with an additional panel connected to reinforce a damaged panel.

[0023] **FIG. 9** is a perspective view of an exemplary embodiment of a filled bastion wall of the present invention including a hexagonal corner unit.

[0024] **FIG. 10** is a perspective view of the insert of **FIG. 1**.

[0025] **FIG. 11** shows the partially filled bastion of **FIG. 1** from a different perspective and without an insert.

[0026] **FIG. 12** is a perspective view of the rightmost cell of **FIG. 1** with two pins staked to the ground.

[0027] **FIG. 13** is a perspective view of a bastion including four rows of piled cells.

[0028] **FIG. 14** is a perspective view of a bastion construction including rows separated by structural beams.

[0029] **FIG. 15** is a perspective view of a camouflaged bastion on a sloped terrain.

DETAILED DESCRIPTION

[0030] The basic components of an exemplary embodiment of a bastion of the present invention, generally designated **10**, are panels **12***a*-**12***j*. The panels **12***a*-**12***j* may be made, for example, from a welded wire frame including wires **14** having, for example, diameters between 3 mm and 8 mm. The wires **14** may, for example, have a rectangular pattern with center to center distance depending on load, for example, 5 cm to 20 cm. The wires **14** may be lined with a metal screen mesh **16** of expanded metal or wire knitted mesh, stitched to the wire frame or connected using staples **18**. Alternatively, the panels **12***a*-**12***j* may be configured without a mesh. However, in this case the wires **14** are spaced close together so as to prevent a filler, used to fill the bastion **10**, such as sand crushed rocks, granulars, etc., from spilling out.

[0031] In the example embodiment of the present invention illustrated in **FIG. 1**, exterior panels **12***a*-**12***h* and interior panels **12***i* and **12***j* form a foldable three-cell structure of reticular pattern. Bastion **10** may be used, for example, as a force protection system for military applications. The length of the bastion **10** may be as long as desired with a minimum of one cell and may extend up to, for example, hundreds of cells.

[0032] As best seen in **FIGS. 2A and 2B**, which illustrate close-ups of a connecting region between two cells **21** and **23**, exterior panels **12***f* and **12***g* are pivotally connected at their sides **4** via hinge **30**, which allows for panel articulation in order to form a reticulate pattern structure that can be folded. **FIG. 2B** is the same view as provided in **FIG. 2A** except a bit closer up and with panel **12***g* shown disconnected for clarity. Depending on the height of the bastion **10**, a hinge may require, for example, a set of 4 up to 24 tube segments.

[0033] Exterior panels **12***f* and **12***g* each include a set of hinge tube segments **20** and **22** respectively. Tube segments **20** and **22** may be welded to their respective panels and are matched and aligned with correspondent tube segments **24** and **26** (**FIG. 3**) connected to interior panel **12***i* by a centering pin **28***a*, which passes through the tube segments **20** and **24**, and by a centering pin **28***b*, which passes through tube segments **22** and **26**.

[0034] Centering pins **28***a* and **28***b* also function also as an anchoring element of the system when staked to the ground. **FIG. 12** is a perspective view of the rightmost cell of **FIG. 1** with pins **28***e* and **28***g* staked to the ground.

[0035] As can be seen in **FIG. 2A**, tube segments **20** and **22** project at an angle towards the inside of bastion **10**. Tubes **20** and **24** are shown using ghost lines because the connection between tubes **20** and **24** via pin **28***a* is at least partially hidden behind panel **12***f*. Panels **12***f*, **12***g* and **12***i* are shown connected in the top view of **FIG. 3**. The remaining panels **12***a*-**12***e* are interconnected in an identical manner using pins **28***a*-**28***m* or, alternatively, using straps **32** (**FIG. 4**).

[0036] As illustrated in the top view of **FIG. 3**, the lining or mesh **16** of the exterior panels **12***f* and **12***g* at hinge **30** is bent as flaps **34** and is used to avoid infill spills through the space **36** between the pivotably connected exterior panels **12***f* and **12***g*. Flaps **34** may be used to prevent spillage between the connection of the other panels as well.

[0037] For observation posts and fire back positions, an insert, such as a duct **38**, may be provided on both interior and exterior panels into which face inserts **40** may be installed. Duct **38** may have an X or Y shape (from a top view) in accordance with the tactical tooth-saw fire pattern. Duct **38** is a rectangular box with a reduced section in a middle section **42** and full sections **44** at the faces of the panels. On the outer face of the bastion **10** these face inserts **40** may be covered with a metal mesh lining (not shown), which both masks the duct **38** and provides protection against objects thrown from outside. At the inner side, a flap gate **46** can be provided, for temperature control. **FIG. 11** shows the bastion of **FIG. 1** from a different perspective and without the duct **38**.

[0038] Interior panels **12***i* and **12***j* do not have full mesh lining allowing the continuity of the infill material configuring a monolithic structure. Further, as can be seen in **FIG. 6**, interior panel **12***i* may have hinge tubes **34** at a point between its sides, e.g., in the middle, for connection via pin **28***n* to hinge tubes **35** welded to another interior panel **12***k*, also without mesh lining. Although not shown, interior panel **12***k* may be similarly pivotally connected to exterior panel **12***e*. Alternatively, interior panel **12***k* may be free floating, connected to exterior panel **12***e* and interior panel **12***i* by straps, or supported on either side by material used to fill the bastion **10**.

[0039] Once the structure has been anchored, for example, by anchoring pins **28***a*-*n* used in the hinges **30**, an infill of filling material, for example, sand, crushed rock, or granulars is laid in compacted layers conforming a monolithic structure to complete the defense system. The bastion **10** of **FIGS. 1 and 11** are shown in a partially filled state so as to expose the interior panels **12***i* and **12***j*.

[0040] The hinged system of the present invention allows for deployment in slopped terrain, as illustrated in **FIG. 16**, by stepping panels **12** in the vertical direction, i.e., hinging the panels at different heights.

[0041] **FIG. 9** illustrates a multi-cell structure filled with sand including two walls **48**, **50** connected by a hexagonal corner unit **52**. Wall **48** includes cells **48***a*-**48***c* and wall **50** includes cells **50***a*-**50***c*. As indicated above, the filling of a single cell with two different granulates may be accomplished, for example, by means of interior panel **12***k* (**FIG. 6**).

[0042] In an exemplary embodiment of the present invention, the bastion **10** may be foldable. **FIG. 7** illustrates three cells **68**, **70** and **72** pivotally pivotably connected at their corners. The cells are shown in a partially collapsed state.

[0043] In an exemplary embodiment of the present invention, a top mesh-lined cover panel **54**, as illustrated in **FIG. 5**, may be pivotally or otherwise connected to a top of any given bastion cell. The panel **54** mitigates the action of whirlwinds and drafts caused by nature or machinery.

[0044] In an exemplary embodiment of the present invention, as illustrated in **FIG. 13**, the bastion **10** is a multiple height or piled bastion including a base having four columns **56***a*-**56***d* of multi-cell structures, a second row having three columns **58***a*-**58***c*, a third row having two columns **60***a* and

60*b* and a top row having a single column **62**. The panels in each row may be connected to adjacent rows using metallic or plastic straps **32** that align and fasten the layers, as detailed in **FIG. 4**. **FIG. 4** is a cross section taken along lines **4-4** in **FIG. 13**. The multi-cell structures may be piled directly on top of each other or may be separated by a structural element **64**, such as a structural beam, flat board, steel deck or plate, as illustrated in **FIG. 14**.

[**0045**] In an exemplary embodiment of the present invention, the above mentioned materials constituent of the system, are resistant to fire attacks and tropical conditions, thus allowing for a longer life expectancy, and reutilization of the elements.

[**0046**] In an exemplary embodiment of the present invention, the screen or mesh **16** lining allows rooting of vegetation, thus providing camouflage to the system. **FIG. 15** illustrates a bastion system of the present invention camouflaged by natural elements, such as vegetation.

[**0047**] In an exemplary embodiment of the present invention, the panel's wire mesh, hinges and expanded metal mesh are environmentally resistant to damage like rust, UV, fungus attack, etc., by means of galvanic protection, or polymeric coating.

[**0048**] In an exemplary embodiment of the present invention, the structure may be used as basic constituent for constructions and fortifications, supporting a roof structure.

[**0049**] Repairs can be made to the bastion by replacing a damaged panel **12** or by strapping an overlapping new panel **66** over an existing damaged panel **12**, as illustrated in **FIG. 8**.

[**0050**] As illustrated in the figures, the panels form box shaped structures. However, three or more panels may be joined in the manner taught above to form other shaped free-standing structures having, for example, triangular or hexagonal cross sections when viewed from above. These free-standing structures may then be interconnected, for example using hinges or straps, to form bastions of varying shapes and sizes.

[**0051**] As many apparently widely different embodiments of the present invention can be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.

What is claimed is:

1. A bastion comprising:

at least three exterior wire panels interconnected so as to form a free-standing structure, each panel pivotally interconnected along each of two sides to an adjacent panel by a hinge connection, said wire panels being covered by one of a metal screen mesh of expanded metal or wire knitted mesh at least one of stitched to the wire frame and connected using staples, said wire panels and mesh being fire resistant.

2. The bastion of claim 1, wherein adjacent side panels are connected in the hinge connection by a pin which passes through a first set of hinge tubes connected to one exterior panel being connected and a second set of hinge tubes connected to another exterior panel being connected.

3. The bastion of claim 1, wherein at least two of the exterior panels are pivotally connected by a strap.

4. The bastion of claim 1, where the free-standing structure is filled with at least one of sand, crushed rock and granular materials.

5. The bastion of claim 1, further comprising a duct having a slot which passes through the free-standing structure.

6. The bastion of claim 5, wherein the duct has two opposite faces each of which connect to a different side panel.

7. The bastion of claim 5, wherein the duct has a flap gate.

8. The bastion of claim 5, wherein the duct has a reduced central cross section.

9. The bastion of claim 1, wherein the bastion comprises at least two free-standing structures each of which comprise hinges, at least one hinge of each free-standing structure pivotally connected to one hinge of another free-standing structure.

10. The bastion of claim 1, wherein the bastion is configured to be collapsible.

11. The bastion of claim 1, wherein the panels share a common height and the pin is longer than the common height.

12. The bastion of claim 11, wherein the pin is staked to the ground.

13. The bastion of claim 1, wherein the bastion comprises at least two vertically stacked free-standing structures.

14. The bastion of claim 13, further comprising a structural beam between each stacked free-standing structure.

15. The bastion of claim 1, further comprising a top panel one of hinged and strapped to a top of the free-standing structure.

16. The bastion of claim 1, wherein each panel includes at least one mesh flap configured to cover an opening in an adjacent hinge.

17. The bastion of claim 9, wherein at least one of the free-standing structures is hexagonal.

18. The bastion of claim 1, wherein the mesh covered wire panels and the pins are at least one of provided with a polymeric coating and galvanic protection.

19. The bastion of claim 1, wherein the free-standing structure includes an interior panel at least one of supported by a filler material used to fill the free-standing structure and connected to at least one exterior panel via one of a hinge connection and a strap.

20. The bastion of claim 1, wherein the free-standing structure includes at least 6 exterior panels and at least one interior panel pivotally connected on one side in a hinge-like manner with two adjacent exterior panels and pivotally connected with two other adjacent exterior panels on an opposite side in a hinge-like manner.

21. The bastion of claim 20, wherein the at least one interior panel includes first and second hinge tubes connected on each side, the first hinge tubes hinged with a first exterior panel via a first pin which passes through the first hinge tubes and hinge tubes connected to the first exterior panel, the second hinge tubes hinged with a second exterior panel via second pin which passes through the second hinge tubes and hinge tubes connected to the second exterior panel, the first and second exterior panels being pivotally interconnected adjacent panels.

22. The bastion of claim 19, wherein different filler materials are used on opposite sides of the interior panel.

23. The bastion of claim 19, wherein at least one of the first pin and the second pin is longer than a height of the panels.

24. A method for repairing a bastion, said bastion comprising at least three wire exterior panels interconnected so as to form a free-standing structure, each panel pivotally interconnected along each of two sides to an adjacent panel by a hinge connection, said wire panels being covered by one of a metal screen mesh of expanded metal or wire knitted mesh at least one of stitched to the wire frame and connected using staples, said wire panels and mesh being fire resistant, comprising strapping a new panel over a damaged panel.

* * * * *

JS 44 (Rev. 3/99)

CIVIL COVER SHEET

The JS-44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

I. (a) PLAINTIFFS

HESCO Bastion Limited

(b) County of Residence of First Listed Plaintiff _____
(EXCEPT IN U.S. PLAINTIFF CASES)

DEFENDANTS

ACS Holdings USA, LLC

County of Residence of First Listed Defendant
(IN U.S. PLAINTIFF CASES ONLY)
NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE LAND INVOLVED.

(c) Attorney's (Firm Name, Address, and Telephone Number)

Richard L. Horwitz (#2246)/David E. Moore (#3983)
Potter Anderson & Corroon LLP
1313 N. Market Street
Wilmington, Delaware 19801 (302) 984-6000

Attorneys (If Known)

II. BASIS OF JURISDICTION (Place an "X" in One Box Only)

- [ ] 1 U.S. Government Plaintiff
- [x] 3 Federal Question (U.S. Government Not a Party)
- [ ] 2 U.S. Government Defendant
- [ ] 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (Place an "X" in One Box for Plaintiff and One Box for Defendant)
(For Diversity Cases Only)

	PTF	DEF		PTF	DEF
Citizen of This State	[ ] 1	[x] 1	Incorporated *or* Principal Place of Business In This State	[ ] 4	[ ] 4
Citizen of Another State	[x] 2	[ ] 2	Incorporated *and* Principal Place of Business In Another State	[ ] 5	[ ] 5
Citizen or Subject of a Foreign Country	[ ] 3	[ ] 3	Foreign Nation	[ ] 6	[ ] 6

IV. NATURE OF SUIT (Place an "X" in One Box Only)

CONTRACT
- [ ] 110 Insurance
- [ ] 120 Marine
- [ ] 130 Miller Act
- [ ] 140 Negotiable Instrument
- [ ] 150 Recovery of Overpayment & Enforcement of Judgment
- [ ] 151 Medicare Act
- [ ] 152 Recovery of Defaulted Student Loans (Excl. Veterans)
- [ ] 153 Recovery of Overpayment of Veteran's Benefits
- [ ] 160 Stockholders' Suits
- [ ] 190 Other Contract
- [ ] 195 Contract Product Liability

TORTS

PERSONAL INJURY
- [ ] 310 Airplane
- [ ] 315 Airplane Product Liability
- [ ] 320 Assault, Libel & Slander
- [ ] 330 Federal Employers' Liability
- [ ] 340 Marine
- [ ] 345 Marine Product Liability
- [ ] 350 Motor Vehicle
- [ ] 355 Motor Vehicle Product Liability
- [ ] 360 Other Personal Injury

PERSONAL INJURY
- [ ] 362 Personal Injury—Med. Malpractice
- [ ] 365 Personal Injury—Product Liability
- [ ] 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- [ ] 370 Other Fraud
- [ ] 371 Truth in Lending
- [ ] 380 Other Personal Property Damage
- [ ] 385 Property Damage Product Liability

FORFEITURE/PENALTY
- [ ] 610 Agriculture
- [ ] 620 Other Food & Drug
- [ ] 625 Drug Related Seizure of Property 21 USC
- [ ] 630 Liquor Laws
- [ ] 640 R.R. & Truck
- [ ] 650 Airline Regs.
- [ ] 660 Occupational Safety/Health
- [ ] 690 Other

BANKRUPTCY
- [ ] 422 Appeal 28 USC 158
- [ ] 423 Withdrawal 28 USC 157

PROPERTY RIGHTS
- [ ] 820 Copyrights
- [x] 830 Patent
- [ ] 840 Trademark

OTHER STATUTES
- [ ] 400 State Reapportionment
- [ ] 410 Antitrust
- [ ] 430 Banks and Banking
- [ ] 450 Commerce/ICC Rates/etc.
- [ ] 460 Deportation
- [ ] 470 Racketeer Influenced and Corrupt Organizations
- [ ] 810 Selective Service
- [ ] 850 Securities/Commodities/ Exchange
- [ ] 875 Customer Challenge 12 USC 3410
- [ ] 891 Agricultural Acts
- [ ] 892 Economic Stabilization Act
- [ ] 893 Environmental Matters
- [ ] 894 Energy Allocation Act
- [ ] 895 Freedom of Information Act
- [ ] 900 Appeal of Fee Determination Under Equal Access to Justice
- [ ] 950 Constitutionality of State Statutes
- [ ] 890 Other Statutory Actions

REAL PROPERTY
- [ ] 210 Land Condemnation
- [ ] 220 Foreclosure
- [ ] 230 Rent Lease & Ejectment
- [ ] 240 Torts to Land
- [ ] 245 Tort Product Liability
- [ ] 290 All Other Real Property

CIVIL RIGHTS
- [ ] 441 Voting
- [ ] 442 Employment
- [ ] 443 Housing/ Accommodations
- [ ] 444 Welfare
- [ ] 440 Other Civil Rights

PRISONER PETITIONS
- [ ] 510 Motions to Vacate Sentence
- Habeas Corpus:
- [ ] 530 General
- [ ] 535 Death Penalty
- [ ] 540 Mandamus & Other
- [ ] 550 Civil Rights
- [ ] 555 Prison Condition

LABOR
- [ ] 710 Fair Labor Standards Act
- [ ] 720 Labor/Mgmt. Relations
- [ ] 730 Labor/Mgmt.Reporting & Disclosure Act
- [ ] 740 Railway Labor Act
- [ ] 790 Other Labor Litigation
- [ ] 791 Empl. Ret. Inc. Security Act

SOCIAL SECURITY
- [ ] 861 HIA (1395ff)
- [ ] 862 Black Lung (923)
- [ ] 863 DIWC/DIWW (405(g))
- [ ] 864 SSID Title XVI
- [ ] 865 RSI (405(g))

FEDERAL TAX SUITS
- [ ] 870 Taxes (U.S. Plaintiff or Defendant)
- [ ] 871 IRS—Third Party 26 USC 7609

V. ORIGIN (PLACE AN "X" IN ONE BOX ONLY)

[x] 1 Original Proceeding [ ] 2 Removed from State Court [ ] 3 Remanded from Appellate Court [ ] 4 Reinstated or Reopened [ ] 5 Transferred from another district (specify) [ ] 6 Multidistrict Litigation [ ] 7 Appeal to District Judge from Magistrate Judgment

VI. CAUSE OF ACTION (Cite the U.S. Civil Statute under which you are filing and write brief statement of cause. Do not cite jurisdictional statutes unless diversity.)

Patent infringement arising from 35 U.S.C §§ 1 et seq., and trademark infringement under the Lanham Act 15 U.S.C §§ 1051 et seq., and the common law.

VII. REQUESTED IN COMPLAINT: [ ] CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23 DEMAND $ _____ CHECK YES only if demanded in complaint: JURY DEMAND: [ ] Yes [x] No

VIII. RELATED CASE(S) IF ANY (See instructions): JUDGE _____ DOCKET NUMBER _____

DATE 05/05/2008 SIGNATURE OF ATTORNEY OF RECORD

FOR OFFICE USE ONLY

RECEIPT # _____ AMOUNT _____ APPLYING IFP _____ JUDGE _____ MAG. JUDGE _____

JS 44 Reverse (Rev. 12/96)

INSTRUCTIONS FOR ATTORNEYS COMPLETING CIVIL COVER SHEET FORM JS-44

Authority For Civil Cover Sheet

The JS-44 civil cover sheet and the information contained herein neither replaces nor supplements the filings and service of pleading or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. Consequently, a civil cover sheet is submitted to the Clerk of Court for each civil complaint filed. The attorney filing a case should complete the form as follows:

I. (a) Plaintiffs-Defendants. Enter names (last, first, middle initial) of plaintiff and defendant. If the plaintiff or defendant is a government agency, use only the full name or standard abbreviations. If the plaintiff or defendant is an official within a government agency, identify first the agency and then the official, giving both name and title.

(b.) County of Residence. For each civil case filed, except U.S. plaintiff cases, enter the name of the county where the first listed plaintiff resides at the time of filing. In U.S. plaintiff cases, enter the name of the county in which the first listed defendant resides at the time of filing. (NOTE: In land condemnation cases, the county of residence of the "defendant" is the location of the tract of land involved.)

(c) Attorneys. Enter the firm name, address, telephone number, and attorney of record. If there are several attorneys, list them on an attachment, noting in this section "(see attachment)".

II. Jurisdiction. The basis of jurisdiction is set forth under Rule 8(a), F.R.C.P., which requires that jurisdictions be shown in pleadings. Place an "X" in one of the boxes. If there is more than one basis of jurisdiction, precedence is given in the order shown below.

United States plaintiff. (1) Jurisdiction based on 28 U.S.C. 1345 and 1348. Suits by agencies and officers of the United States, are included here.

United States defendant. (2) When the plaintiff is suing the United States, its officers or agencies, place an "X" in this box.

Federal question. (3) This refers to suits under 28 U.S.C. 1331, where jurisdiction arises under the Constitution of the United States, an amendment to the Constitution, an act of Congress or a treaty of the United States. In cases where the U.S. is a party, the U.S. plaintiff or defendant code takes precedence, and box 1 or 2 should be marked.

Diversity of citizenship. (4) This refers to suits under 28 U.S.C. 1332, where parties are citizens of different states. When Box 4 is checked, the citizenship of the different parties must be checked. (See Section III below; federal question actions take precedence over diversity cases.)

III. Residence (citizenship) of Principal Parties. This section of the JS-44 is to be completed if diversity of citizenship was indicated above. Mark this section for each principal party.

IV. Nature of Suit. Place an "X" in the appropriate box. If the nature of suit cannot be determined, be sure the cause of action, in Section IV below, is sufficient to enable the deputy clerk or the statistical clerks in the Administrative Office to determine the nature of suit. If the cause fits more than one nature of suit, select the most definitive.

V. Origin. Place an "X" in one of the seven boxes.

Original Proceedings. (1) Cases which originate in the United States district courts.

Removed from State Court. (2) Proceedings initiated in state courts may be removed to the district courts under Title 28 U.S.C., Section 1441. When the petition for removal is granted, check this box.

Remanded from Appellate Court. (3) Check this box for cases remanded to the district court for further action. Use the date of remand as the filing date.

Reinstated or Reopened. (4) Check this box for cases reinstated or reopened in the district court. Use the reopening date as the filing date.

Transferred from Another District. (5) For cases transferred under Title 28 U.S.C. Section 1404(a) Do not use this for within district transfers or multidistrict litigation transfers.

Multidistrict Litigation. (6) Check this box when a multidistrict case is transferred into the district under authority of Title 28 U.S.C. Section 1407. When this box is checked, do not check (5) above.

Appeal to District Judge from Magistrate Judgment. (7) Check this box for an appeal from a magistrate judge's decision.

VI. Cause of Action. Report the civil statute directly related to the cause of action and give a brief description of the cause.

VII. Requested in Complaint. Class Action. Place an "X" in this box if you are filing a class action under Rule 23, F.R.Cv.P.

Demand. In this space enter the dollar amount (in thousands of dollars) being demanded or indicate other demand such as a preliminary injunction.

Jury Demand. Check the appropriate box to indicate whether or not a jury is being demanded.

VIII. Related Cases. This section of the JS-44 is used to reference related pending cases if any. If there are related pending cases, insert the docket numbers and the corresponding judge names for such cases.

Date and Attorney Signature. Date and sign the civil cover sheet.

AO FORM 85 RECEIPT (REV. 9/04)

United States District Court for the District of Delaware

Civil Action No. 66

ACKNOWLEDGMENT OF RECEIPT FOR AO FORM 85

NOTICE OF AVAILABILITY OF A UNITED STATES MAGISTRATE JUDGE TO EXERCISE JURISDICTION

I HEREBY ACKNOWLEDGE RECEIPT OF 1 COPIES OF AO FORM 85.

5/5/08
(Date forms issued)

(Signature of Party or their Representative)

FRANK JOYCE | PARCELS, INC.
(Printed name of Party or their Representative)

Note: Completed receipt will be filed in the Civil Action